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Established 1835 — Railway & Commercial Gazette

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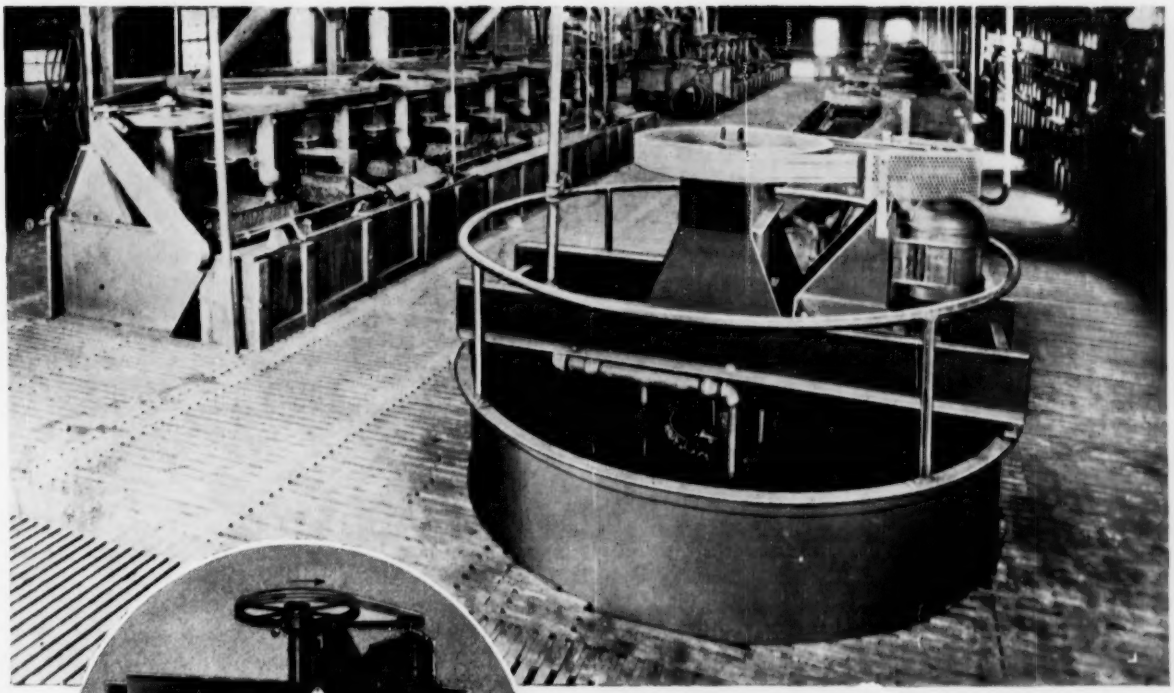

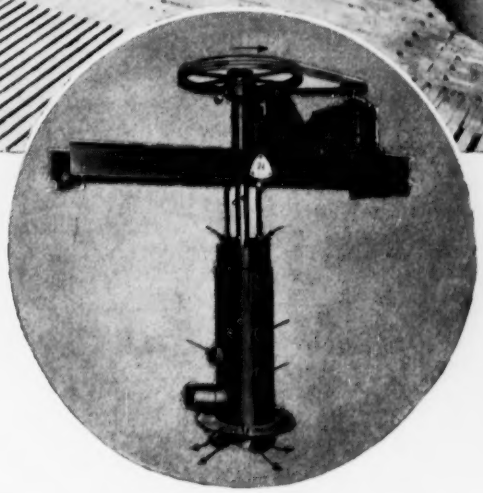

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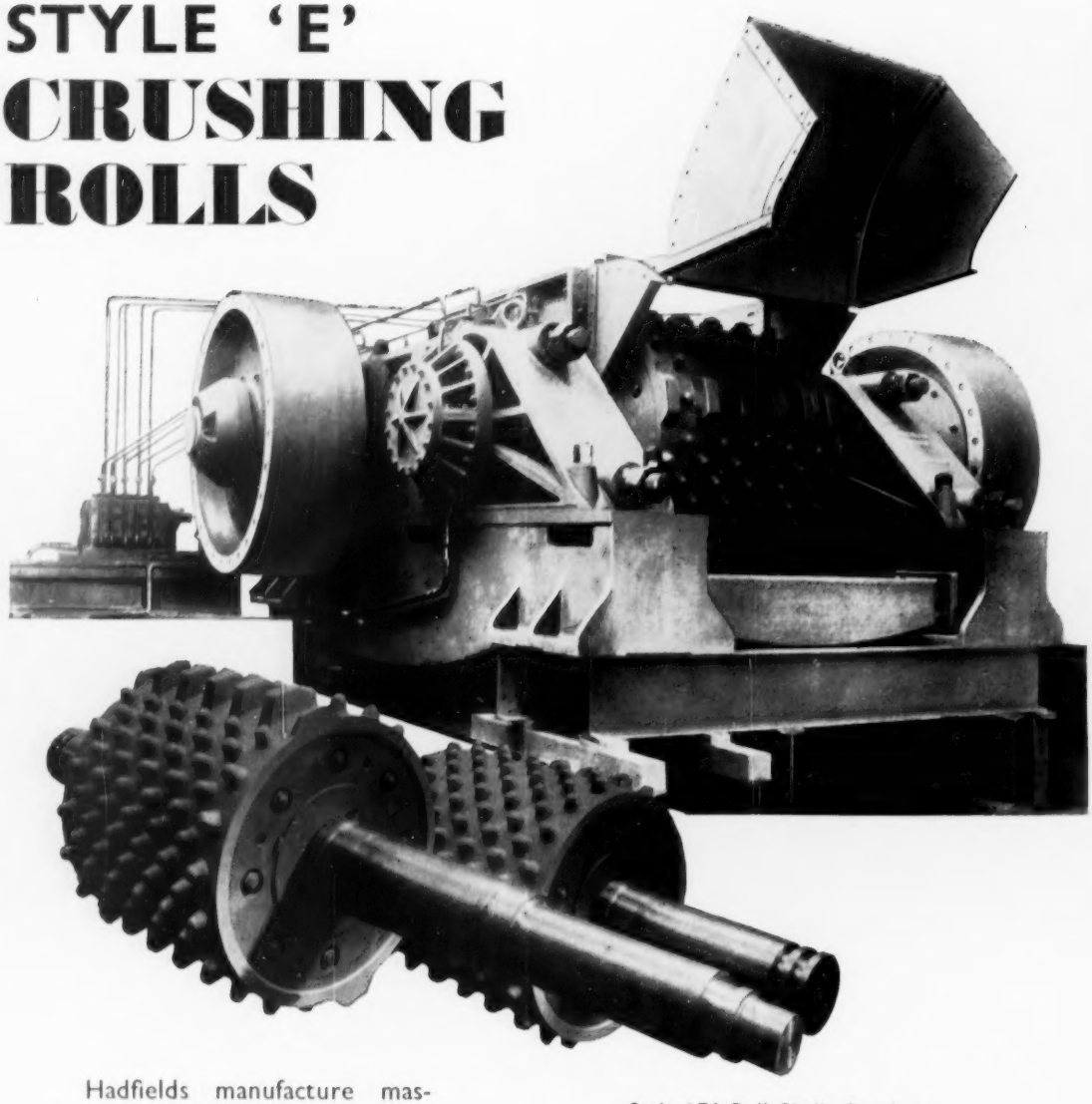

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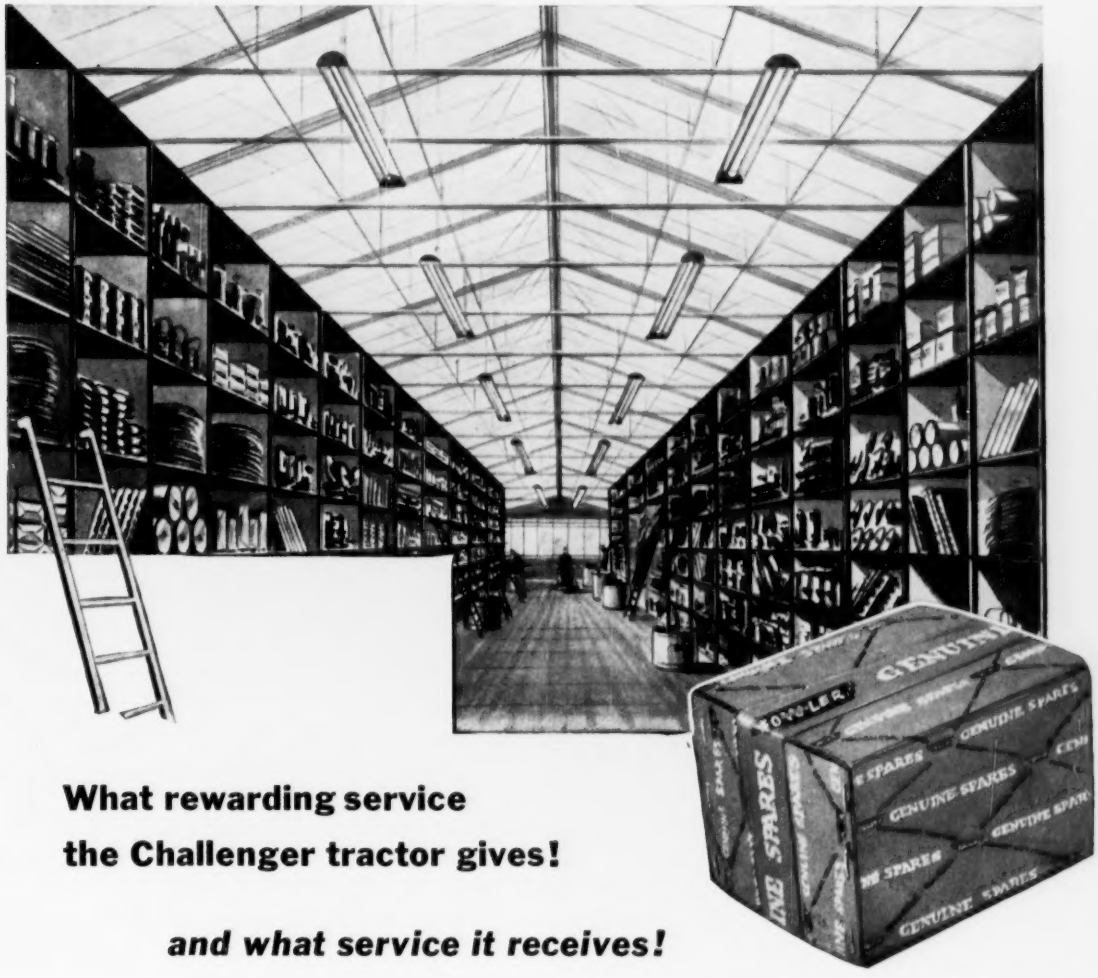

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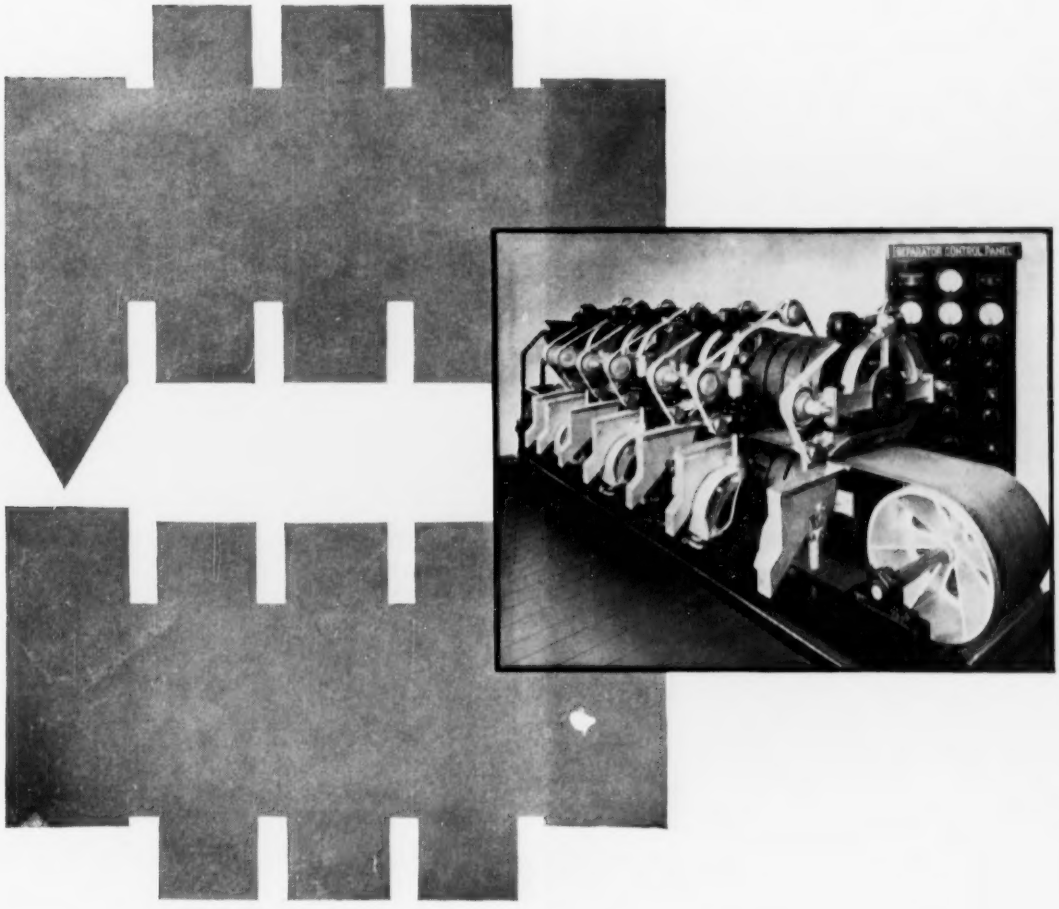

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NOTES AND COMMENTS

Revision of U.K. Tax Codes: Time for Decision

Since its formation shortly after the end of the war, the British Overseas Mining Association has been waging a constant war against the Chancellor on behalf of U.K. mining companys operating overseas. The Association is concerned actively with obtaining more favourable taxation treatment for such companies but the sternest criterion of its success—or rather, the lack of it—lies in the fact that in recent years there has been a constant trek of London registered companies overseas.

Two events during the past week have served to emphasize once more the continuing seriousness of the position of those undertakings remaining in the U.K. The first has been the annual report of British Overseas Mining itself. In it, the president, Mr. J. Ivan Spens, recapitulates the work of the Association *vis-à-vis* taxation during the past year. Of particular potential importance has been the letter addressed to the Chancellor in January this year suggesting that the time had come for a general reconsideration of the whole question of mining taxation and expressing the hope that Mr. Butler might be able to deal with this matter in his budget for 1955-56 by exempting profits earned overseas from U.K. tax or at least, as a first step, by creating a tax differential between profits earned at home and overseas.

If the whole range of overseas profits could not be dealt with at this stage, the special position of the U.K. companys operating abroad should, the Association urged, be recognized by the granting of percentage depletion allowances as in the U.S., Canada and elsewhere; by greater elasticity in the treatment of depreciation of fixed assets; and, by the admission of doubt tax relief on various types of overseas tax such as production taxes, royalties and the like. Representations along similar lines were put before the Royal Commission on the taxation of profits and income whose final report was published on June 7.

While the Association has been hammering away with commendable pertinacity—and with some success—at what appears to most impartial observers as a wholly justifiable case, it cannot be said that their efforts have as yet been amply rewarded. Yet it may be that in future budgets Chancellors of the Exchequer will bring themselves to see the taxation of self-exhausting industries in a more realistic light, as their counterparts in the U.S.A., Canada and elsewhere have already done.

It is in this brief context that the second item of news this week to which we refer can be considered. This is the bald announcement that the South West African Company, which was registered in this country in 1892, has been advised by the Treasury that consent will not be granted to the proposed transfer of the company's residence to South West Africa. No explanations are, of course, offered in these cases. It is, however, more than a fair assumption that whatever its ultimate reactions in practice, the Treasury has never looked with favour upon this persistent emigration from London. At the same time, it needs to be recorded that the Rhodesian copper companys of the Anglo American and Rhodesian Selection Trust groups, together with others such as Messina (Transvaal) and Tanganyika Concessions have all obtained permission in recent years to transfer their control to the Rhodesias and that there has been a steady efflux of gold mining companys working in Australia to the scene of their operations. In fact it was only in September that the old Sons of Gwalia company, which was formed here, in 1898, was granted consent to move to the Commonwealth. In the circumstances, the management of South West Africa Company have every right to feel aggrieved at this week's decision that the undertaking must remain here and continue to be subjected to the high level of U.K. taxation.

Indeed, it is not easy to see what conclusions, if any, ought to be drawn by the U.K. mining industry operating overseas. Is the Treasury's refusal in the case of South West Africa to be treated merely as an isolated instance or, does it represent a basic change in policy concerning the whole question of emigration of companies? And if so, does it imply that the Treasury have in mind the adoption of a more benevolent attitude towards U.K. companies in fiscal matters? These questions are for time to answer. But, if a more favourable view of mining taxation is not to be adopted in the near future and U.K. undertakings at the same time are to be prevented from emigrating, the "ring fence" around these islands thus created can hardly redound to the credit of this country and in any event will definitely place a time limit by which London can be considered as one of the most important world centres of mining finance.

Inflation in Chile

Despite denials from the operating companies, persistent reports reach us from Chile of further impending labour troubles. A major cause of unrest lies no doubt in the continuing inflationary spiral. In this context particular significance attaches to the recent conference between the President of Chile and Opposition leaders, at which the former sought their support in a programme of freezing prices, wages and salaries to break the inflationary spiral. It is understood that the proposals include limiting wage increases in 1956 to only 50 per cent of the rise in the cost of living in 1955 which has been put at 78 per cent. As compensation the prices of basic commodities could only be increased by government decree. Prices would be frozen at the level ruling on November 16.

Senor Ibanez is such a controversial figure in Chilean politics that he will be lucky to get support. His main hope is that the Opposition have little love for the miners and may offer help on this score. Much more doubtful is whether he would get the miners to co-operate. If he does not he risks not merely defeat but also rebellion. However, it seems clear that the World Bank and other potential lenders have made it a condition of help that inflation should be fought more vigorously. It may not be thought the best way of fighting it, but for a country with such a rudimentary financial structure and with such deeply ingrained inflation as Chile it may be doubted whether anything short of a shock measure of this sort would suffice.

The *American Metal Market's* correspondent in Santiago in a despatch dated November 11 refers to the circumstances in which the dollar peso rate was raised to 300 for the copper companies and to the consequences of the increase. In article 12 of the Copper Law, clause 2 states, "The companies must sell this foreign exchange to The Banco Central de Chile, who shall be obligated to buy it at the free banking rate." Since the free banking rate was 300 pesos to the dollar the government was forced to yield this rate though it did it belatedly. The correspondent then goes on to say that in 1954 the dollar costs of the pesos needed by the American companies was $70,500,000; with the peso rate in 1955 at 200 pesos and in 1956 presumably at 300 pesos the dollar cost to the companies would be stabilized since these increases rather more than take care of the 100 per cent increases in prices caused each year.

He then goes on to say, "on the one hand the men are fully aware of the enormous financial advantages given by the government to the companies so that they can operate free of the fearful inflationary process, and on the other the companies have now a greater cushion than ever before to absorb increases not only in the cost of materials but in fringe benefits." So long as the copper companies can get their pesos requirements at a free rate it seems they are insulated from inflation. In that case there seems no reason why the companies should not grant wage increases since the true cost of these wage increases will fall on the Chilean Government and Chilean economy.

On the other hand, what happens when the Chilean Government announces a programme, as it has done, of wage and price stabilization? It seems that the copper companies will still be insulated from inflation but the workers only if the freeze is 100 per cent successful. The Chilean miners have long had a reputation for belligerency and it is unlikely that they would accept such a situation. A good deal of this is surmise; the government may be reluctant to continue to meet the companies' pesos requirements at a roughly standard dollar cost; the price and wages freeze proposal may not, in fact, ever be carried through; but whatever happens yet another shaft of light has been thrown upon the organization of the Chilean copper industry since the new Copper Law was established.

The Gold Coast Mining Industry in 1954-55

The report of the Gold Coast Mines Department on the territory's mineral industry during the year 1954-1955, has lately been received.

As in previous years, gold, diamonds, manganese and bauxite remained the Gold Coast's only mineral exports, although considerable activity in quarrying operations took place during the year. The 788,901 oz. of gold produced last year constituted the highest output since 1941-1942.

In keeping with gold, the value of diamond exports increased by over £400,000 when compared with 1953-1954, while exports of bauxite maintained the trend, surpassing by almost 70,000 tons the exported tonnage of the comparable previous yearly period.

In all, during 1954-1955, the total value of Gold Coast mineral production amounted to £18,807,838. Gold bullion produced provided £9,782,372 at 248s. per f.oz., while provisional figures from the Government Statistician report the value of diamonds, manganese ore and bauxite as being £4,432,099, £4,292,826 and £300,541 respectively.

At the end of the year nine Gold Coast companies were producing gold from lode mines and one was conducting dredging operations. Lode mining on conglomerate reef was carried out by Amalgamated Banket Areas Ltd., and Taquah and Abosso Mines Ltd., while lode mining on quartz reefs was continued at Ariston Gold Mines (1929) Ltd., Ashanti Goldfields Corporation Ltd., Bibiani (1927) Ltd., Gold Coast Main Reef Ltd., Konongo Gold Mines Ltd., Lyndhurst Deep Level (Gold and Silver) Ltd., and Marlu Gold Mining Areas Ltd. Dredging of alluvial deposits was carried on by Bremang Gold Dredging Co. Ltd. No mining operations of any type took place in the Northern Territories during the year.

Five diamond producers operated on the Gold Coast during the year. Some 2,234,572 ct. of diamonds were exported to value £4,432,099, an increase of 64,092 ct. and £418,568 over the previous returns.

Throughout the year Akim Concessions Ltd. restricted operations to the Sensenkwakwa Concession, and although the grade of gravel treated was slightly lower, the 38,136 cu. yd. dredged produced an increased weight of diamonds over the previous year, 30,262 ct. being exported. Cayco (London) Ltd., a privately owned company, treated 23,890 cu. yd. and exported 52,384 ct.; Holland Syndicate N.V. carried on operations at the Apryensua Concession, treating 92,121 cu. yd. and exporting 168,899 ct.; while at Offin River Estates Ltd., 3,761 cu. yd. were treated and 2,477 ct. exported. Further, at Consolidated African Selection Trust Ltd., normal diamond mining operations were continued in the Akwatia-Esuboni area. The company treated 376,647 cu. yd. during the year, exporting 852,134 ct.

In so far as the African diamond industry is concerned, exports of diamonds by holders of digging licences amounted to 1,128,415 ct. valued at £2,367,224, compared with 1,200,435 ct. to value £2,215,915 for the previous year. Six hundred and seventeen digging licences were issued during the year, and local diamond purchasing facilities were established with the opening for business of the Government Diamond Market in Accra in July, 1954.

The African Manganese Company Ltd., as in the preceding year, was the sole producer of manganese on the Gold Coast, exporting 398,159 tons valued at £4,292,826, while production of bauxite by the British Aluminium Ltd. was maintained steadily throughout the year with 170,830 tons exported to a value of £300,541.

Altogether, mining and quarrying employ some 49,400 persons on the Gold Coast. The complete and concise report bears signature of C. W. F. Bond, Chief Inspector of Mines.

Problems of the S. A. Gold Mining Industry

In the following article our South African correspondent discusses some of the thoughts being discussed in Union mining circles at the present time. Although the points raised below have not become matters of practical politics, our correspondent writes that there is every likelihood of their becoming of increasing importance before very long.

The cost of the increased benefits to about 26,000 European mining employees awarded by way of increased pay and allowances and arrived at between the Mining Unions' Joint Committee and the Gold Producers' Committee of the Transvaal and Orange Free State Chamber of Mines, will mean an additional liability for the gold mining industry of about £1,000,000 a year or roughly 4d. per ton milled. Parcelled out, as it will be, between the different mines this sum cannot be viewed as being much of an additional burden for the industry to bear. But that is to talk in general terms; to many of the older and lower-grade properties this recent pay increase comes near to being the proverbial straw.

That this is so can be quite easily observed from the fact that—excluding uranium producers and the new gold producers—there are eight out of fifty-four gold mines operating on a working profit of less than 2s. per ton milled. And although the curve of working costs has flattened out perceptibly in recent months the trend is still upwards.

While it would be foolish in the extreme to over-state the importance of the pay awards, coming as it does on top of the inexorable cost squeeze and, unfortunately, the seasonal decline in the native labour supply it has acted as the event which has rivetted attention on the general economic situation of the South African gold mining industry. Broadly speaking, gold producers can be divided up into those producers having reasonable profit margins with which to manouvre in the face of any unexpected difficulties, and those whose working profits per ton milled or per ounce produced are barely sufficient to keep the mines operating.

SHOULD SOME MINES BE CLOSED DOWN?

The sixty-four dollar question that is being asked is, therefore, how much longer can some of the old producers be kept going and whether, in view of the tight labour supply position, both European and native, it is worthwhile to keep them in production. This latter point quite obviously cannot be expected to receive unanimous approval from the big mining groups who control these properties and naturally enough the stimulus to analyse the present problems and make constructive suggestions as to a way out of the seemingly inevitable impasse is coming from those whose interests are largely focused on the younger mines.

By and large, the line is being taken that in the national interest it is desirable to produce as much gold as possible and thus the question boils down to how that can be achieved: to concentrate on raising the output from the new mines by transferring labour and resources from the older mines, or to continue making determined efforts to raise the productivity per shift of the available labour supply over the whole industry. Opinion seems to favour the argument that if the older producers were changed into "small mines" operating on a reclamation basis, on smaller tonnages and low overheads, the transference of the skilled labour to the new mines would result in gold production being raised above that now produced by the whole of the industry.

This is not to say that the mining houses have not achieved success in attracting additional labour but the quality of the European miner working in the Orange Free State mines is considered as being definitely below the average efficiency of those working on the Rand and that, in spite of mechanization, planning and modern techniques, productivity in the O.F.S. is not as high as it ought to be. Moreover, the millions of pounds expended by the various mining houses to make the new mining areas attractive has not resulted in an unqualified success a there is still a disinclination on the part of many miners to work there.

Another and important aspect of the problem is that the gold mining industry as a whole is suffering from the familiar situation of too few workers chasing too many jobs. Nor is this labour inflation confined to the mining industry.

MODERN MANAGEMENT METHODS NEEDED

This was shown by the statistics given by Mr. Charles Bedaux, in his paper presented to the Institution of Mechanical Engineers in Johannesburg at the beginning of last month in which he declared that the prevailing average of individual productivity in South Africa did not reach 60 per cent of that which it ought with the existing equipment and methods at present employed. Mr. Bedaux's opinion was that by the adoption of modern management methods the country's economic wealth could be increased two-and-a-half times. Indeed, the South African gold mine with the highest productivity has an output per native per shift two-and-a-half times greater than that of the mining property with the lowest productivity rate, and this cannot be entirely attributed to differences in working conditions. A leading consulting engineer in his contribution to the discussion on Mr. Bedaux's paper said that with regard to the mining industry the productivity of native labour between the years 1940 and 1953 had increased by 28 per cent—the percentage increase in efficiency required of the native labour force if the existing reduction plants were to run to full capacity.

So much for some of the main issues in the present situation affecting the South African gold mining industry. One of the main suggestions to overcome present difficulties is to either close down the old mines, or transform them into "small mines". Either of these alternatives would certainly result in an economic upheaval, particularly on the East Rand where it is doubtful whether secondary industry has developed sufficiently to avoid the creation of an economic vacuum should some of the mines be closed down. At the same time it is argued that if the Bethel area comes up to currently held expectations it would, in due course, fill the gap.

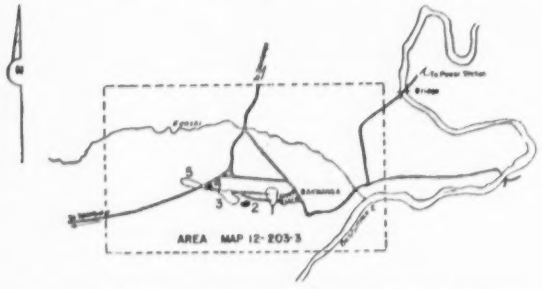
With regard to the suggestion of transforming some of the older properties into "small mines" a case can be made out for such a change. At present shareholders in these older properties are not receiving much in the way of dividends now and in some cases none at all. But if the suitable older properties were put on a reclamation basis shareholders would be provided with some return while from the national viewpoint such a move would release an appreciable number of workers to raise the output of the new and richer mines. After all, a number of properties are operating on this basis at present and are doing well.

From the workers point of view, it is argued that as the level of wages and salaries is determined by what the marginal properties can bear the gold mining industry cannot possibly be in a position to compete for a limited labour supply against other industries. *A fortiori* the elimination of these old properties would allow for higher wages and in consequence the employment of workers on a qualitative rather than a quantitative basis.

Diamond-bearing Deposits at Bakwanga, Belgian Congo

The large increase in the output of Société Minière du Bécéka is attributed principally to additional geological investigations that revealed the occurrence of extensive areas of kimberlitic breccia, as a result of which the Disele mine was opened to exploit the deposits, and the application of large scale mechanization, greatly facilitated by the completion of a second hydro-electric station in the area. These realizations are borne out by the fact that the Bécéka concession of diamond mines in the Belgian Congo produced some 60 per cent by weight of world production of diamonds of all types in 1954. The following article discusses the geology of the Bakwanga field and the increased knowledge of the nature of its diamond occurrences, concluding with a description of the current mining and recovery operations at the Disele workings in light of the new mechanization programme. The article is condensed from *Mineral Trade Notes, Special Supplement, No. 46*, published by the U.S. Bureau of Mines.

The different known detrital deposits of the Bushimaie Valley, Belgian Congo, extend more than 60 kilometres, starting from the Sankuru and extending as far as the Katsha rivers. The most important deposits form three groups; The Tshimanga, the Bakwanga and the Lukelenge.



Location of massives of Kimberlitic Breccia at Bakwanga

Only the alluvial deposits of the Tshimanga group are known up to the present. The Bakwanga group is situated in the vicinity of the confluence of the Kanshi and the Bushimaie rivers and includes the most important deposits of the region—both alluvials and those on the flanks of the valley.

The Lukelenge group is situated about 12 kilometres downstream of Bakwanga, these include some alluvial deposits of secondary interest, the exploitation of which was virtually finished by 1950. From here to the Sankuru, the prospecting revealed no more than some local concentrations and some small deposits of little importance. The Lukelenge deposits seem to present some mechanical concentrations of diamonds transported by the streams and originating around Bakwanga.

The different sedimentary formations in which the area between the Kanshi and the Bushimaie is divided and where the deposits of kimberlitic breccia are found shows a sequence of yellow sand, fine, brown, and limonitic at maximum thicknesses of 30 m.; a gravel horizon, with pebbles and angular boulders (or with roughened edges) pieces of hard silicified sandstone; sometimes rounded elements are present at maximum thickness of 3 m.; a soft siliceous sandstone, violet, yellow, brown, stratified and small lenses of brown shale at a thickness of more than 40 m.; and dolomitic limestones and dolomites of the Bushimaie system.

THE KIMBERLITIC BRECCIA MASSIVES

The systematic prospecting by deep pits, carried out between 1947 and 1950, revealed four other deposits of kimberlitic breccia west of No. 1 massive which form a chain that roughly marks the very flat crest of Disele spur. The series forms a zone 100 to 300 m. wide running roughly east-west and extending over more than 3 kilometres immediately west of Bakwanga Post.

The method of prospecting by deep pits, the only satisfactory one from the standpoint of sampling the diamond content, was insufficient when the examination of the primary deposits was begun. The thickness of the zone thus explored was limited to about 50 m., which allowed investigation of the detrital deposits and barely entered into the massives of breccia. This work was complemented by core drilling and underground exploration.

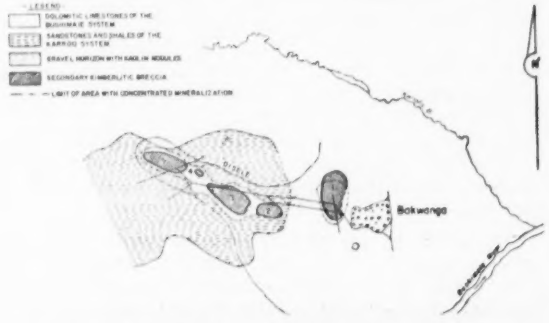
THE DIAMANTIFEROUS BRECCIA

It is within the eastern region of Kasai and especially on the advanced plateau included between the Bushimaie and the upstream course of the Kanshi that the altered deposits, which appear to be connected directly with the primary diamond deposits, are found.

The Bushimaie region around Bakwanga consists of a limestone-dolomite substratum belonging to the Bushimaie system and especially visible in the valleys and on their slopes. Over this substratum the beds of sandstones and shales of the Karroo system are spread out; south of the Kanshi they clearly draw away from the valley. Finally, covering irregularly both of the two systems, there is an arenaceous covering, which always begins with small pebbles and extends widely over all the region.

The calcareous dolomitic framework of the Disele Plateau has been subjected to a karstic evolution. This has led to the formation of sink holes and wide and deep openings into which have been placed the remnants of the beds of sandstones and shales of the Lualaba series of the Karroo system; thus they have locally been preserved from erosion. It is in relation with these remnants of the Karroo that a more or less altered diamantiferous formation has been found, one which suggests a deeply altered kimberlite because of certain characteristics.

The composition of the diamantiferous breccia continues to intrigue the investigators. Whatever the depth at which it appears, the brechiform mass presents a uniformity of original composition as far as the inclusions it contains are concerned. The composition includes small angular


LEGEND
DOLOMITIC LIMESTONES OF THE BUSHIMAIE SYSTEM
SANDSTONES AND SHALES OF THE KARROO SYSTEM
GRAVEL HORIZON WITH RADIOLITE NODULES
SECONDARY KIMBERLITIC BRECCIA
LIMIT OF AREA WITH CONCENTRATED MINERALIZATION
Bakwanga

Geological map of the area between the Kanshi and Bushimaie rivers

blocks of limestones or of dolomites of 1 to 25 cu. m. in size; small subangular fragments of reddish violet schists resembling those at the base of the Bushimaie system; subangular blocks of hard sandstones, probably from the same source; fragments of soft sandstone (Karroo); many rounded blocks of granite; and fewer blocks of plagioclase feldspar with biotite and of eclogite. Diamonds, ilmenite, and garnet are well represented within the mass, while zircon and diopside are rare.

VARIATIONS OF COLOUR

The mass found among these inclusions is red toward the top and passes into yellowish grey or greenish grey, then to bluish green at depth. The same variations are observed laterally. Toward the top a decalcification is noted also, expressed by the disappearance of the small fragments of limestones of the Bushimaie system as inclusions and by the disappearance of the filaments of secondary calcite which run through the bluish rock. These same variations are to be seen at the lateral border. The mass found among the inclusions when it is bluish shows some small nodules of 1 to 4 mm. size that are clean, uncoloured, and bluish at the periphery. These are formed chiefly of calcite.

Some fluted slickensides with opalized surface were noted in the drill-hole cores. The presence, although rare, of inclusions of eclogite and of minerals such as zircon and chromiferous diopside, as well as the general presence of diamonds and of magnesian ilmenite, certainly suggests a kimberlite. On the other hand, the mineralogical composition of the ground mass, still poorly defined, clearly draws away from the composition of this rock. No traces of the old crystals of olivine were found, which, with a reticulated structure, persists in a more or less well-conserved state, despite serpentinization and subsequent transformation, in the kimberlite of South Africa and Pike County, Arkansas. The presence of antigorite is not certain. Calcite is generally present, and many small grains of quartz are found. Chlorite has been identified.

DEPOSITS FROM THE BRECCIA

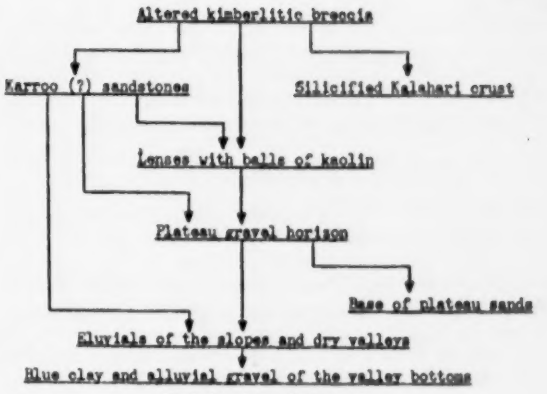
Independent of this deposit of a rather special character, there are some others that have been derived in a detrital manner. The tabular sandstones that are found near the Bushimaie downstream from Bakwanga Post are so derived. These are covered by huge blocks of siliceous sandstone coming from the destruction of the crust of the Kalahari formation. It is not possible to say whether this diamantiferous sandstone belongs to the Karroo system or to the base of the Kalahari system.

It is necessary to point out that the eluvials, the slope debris, and the filling of the dry valleys within the limestones are all made up of fragments of silicified limestones and cherts, with which products coming from the kimberlite-appearing breccia are mixed.

The diamonds are widely distributed within the alluvials of the valley bottoms, both on the Bushimaie and on the Kanshi, and they are also present in a blue clay on which the alluvial gravels rest. This blue clay appears to be formed, at least in part, from the finest particles coming from the destruction of the diamantiferous breccia.

From the point of view of the presence of diamonds, the silicified crusts of the Kalahari, of which some debris remains, constitute a possible site, but not a certain one, whereas the Karroo sandstones, generally barren, can exceptionally and locally contain diamonds.

The principal mining in the Bakwanga area is being done on the Disele Plateau, west of Bakwanga Post. Work has


Altered kimberlitic breccia
Karroo (?) sandstones
Silicified Kalahari crust
Lenses with balls of kaolin
Plateau gravel horizon
Base of plateau sands
Eluvials of the slopes and dry valleys
Blue clay and alluvial gravel of the valley bottoms

Relationship of deposits

extended over an area approximately three kilometres long and one kilometre wide, covering the zone underlain by the kimberlite bodies, and the mineralized material has extended around the bodies. Average diamond content of the gravel being mined at Disele was placed at 9 ct. per cu. m. in March, 1954. This was said to be slightly above the 8 ct. tenor of all the reserves.

OPERATING EQUIPMENT

LeTourneau equipment is used to strip the waste material overlying the diamantiferous gravel. In all, 14 Tourneaupauls are used, and 9 additional bulldozers are in service, acting as pushers during the loading cycle and in other work. The Tourneaupauls (scrapers) have an average capacity of 5.5 cu. m. In stripping, the average performance is 560 cu. m. per scraper shift of about 14,000 cu. m. per 25-day month.

It was necessary to strip 1,500,000 cu. m. of overburden before diamond mining could begin. In March, 1954, stripping was at the rate of 2,000,000 cu. m. a year, which is expected to be increased to 2,500,000 cu. m. to 3,000,000 cu. m. In March, 1954, the overburden being stripped had an average thickness of 20 m. The underlying diamantiferous material is known to continue to a depth of at least 60 to 80 m. The ratio of overburden to diamantiferous gravel was currently 4 : 1. Total volume of overburden and gravel then being handled was over 3,000,000 cu. m.

It was expected that by early 1956 this figure will be much higher, as it was planned to handle a much higher ratio of waste to payable material with the use of additional and larger stripping equipment. In fact, one of these machines was in service in May, 1955, namely an excavator such as those used in the brown coal fields of Germany and with the capacity to handle 600 cu. m. per hr., which would easily account for the additional 1,000,000 tons of overburden per year. A Lubeck rotary shovel, also of German origin, was to be installed. This unit was expected to handle 150 cu. m. per hr.

MINING BY SHOVEL

The diamantiferous ground is mined by shovels. The equipment used consists of 16 shovels of 1.5 cu. m. capacity, of which two are of Marion manufacture and 14 of Bucyrus-Erie. In addition, there are operating one German shovel of 2.5 cu. m. capacity, one Loraine shovel and four small Austin-Western shovels. All these equipments are electrified except two of the Austins, which are internal combustion units. There is also a Demag 2 cu. m. dragline, used in various applications.

The shovels load into Tournarockers or Tournahoppers

of 8-9 cu. m. capacity, and the fleet consists of 29 and 5 units respectively. The Tournarockers have proved the more satisfactory under local conditions. These transport units haul the spoil to the field concentrators, the length of a round trip haul being 5½ to 6 kilometres. In stripping, the round trip to dump and return averages 2 kilometres.

FIELD CONCENTRATION

In March, 1954, a log washer and nine washing plants were in operation on the field. Of the latter, one was a 14 ft. unit and the others were 8 ft. units. Four 8 ft. units were in service on the Kanshi River, north of Bakwanga, and two were at Tshimanga, on the Bushimaie, upstream of and 32 air-line kilometres from Bakwanga. The 8 ft. pans have a normal capacity of 100 cu. m. per hr., the 14 ft. pan, 200 cu. m. per hr.

The log washer treats the feed from the Disele operations and has a capacity of 1,000 cu. m. per day, working three shifts, or around 300,000 cu. m. per year. A plant equipped with 8 ft. pans treats the material from the log washer. The jig section has been eliminated from the circuit, and the product from the second pan goes directly into sealed containers for transfer to the central picking plant. The 14 ft. pan plant treats around 250,000 cu. m. per year and is operated on gravel from Colline No. 1, the operations near Bakwanga Post.

CLEAN-UP PLANT

Concentrates from field washing plants are collected in sealed steel tanks of about 1 cu. m. capacity. These are transported to the central treatment plant near Bakwanga Post by a specially designed unit known as the Brooks Load Lugger. This unit consists of a 3 ton truck with equipment for picking up the concentrate tanks and emptying these into the receiving hopper at the treatment plant.

The heavy-medium unit installed in the central treatment plant in 1953 has given good results. A ferro-silicon medium is used and the density maintained is 2.9. This unit has an output of concentrates of 10 to 20 cu. m. per day, and the tenor of these is 3,000 to 4,000 ct. per cu. m. Therefore, this operation reduces the volume by about one half and raises the tenor around 2.6 times. The concentrates from the unit are enriched further by magnetic separation and the seven grease tables provide a final product from which the diamonds are picked by hand.

The central treatment plant at the middle of 1954 was handling 30 cu. m. of field concentrates per single 8-hr. shift and employed 93 workmen. Before installation of the heavy-medium unit, two shifts were worked. Assuming these employment figures were averages for 1948 and 1953, there has been an increase in diamonds recovered per worker-year in the central treatment plant, from 87,896 ct. to 129,205 ct., or 47 per cent. Daily output of the clean-up plant averages 40,000 ct., which gives 1,000,000 ct. per 25-day month and indicates an average content of 1,333 ct. per cu. m. in the field concentrates treated. The range was reported as from 1,000 to 2,000 ct. Thus, taking the reported average tenor of gravel treated as 9 ct. per cu. m., the ratio of concentration by the field washers was 1 : 148.

Installation of the Young hydro-electric plant, situated on the Lubilash River about 7 kilometres upstream from the junction of this stream and the Bushimaie, was begun about four years ago and has been completed.

Four turbines are installed with a total potential of 10,000 kva. These turbines are of the Trollhattan type and were made by a Swiss firm. The A.C. generators are driven at 250 r.p.m. and produce 50 cycle power at 550 v. The turbines are supplied with water through an 860 m. intake canal. Depth of water in March, 1954, was 6.5 m. but when full reaches 8.5 m. Total head is 16 m. Discharge was reported at 20 cu. m. per sec. but the sloping banks of the canal provide for one of 65 cu. m. in the high-water stage. The station is at an altitude of about 600 m. and is 25 kilometres air-line distance north-east of Bakwanga. Power generation in March, 1954, was at the rate of 800,000 kw.-hr. per month, a figure which it was expected will be doubled by early 1956.

The Tshala I, an 1,850 kva. plant, which was the only source of hydro-electric power for Bakwanga before completion of the Young central plant in 1952, is just downstream and across the river from the latter. It is kept on a standby status, to be activated in case of interruption of the newer plant.

THE COST FACTOR

In March, 1954, employment was placed at 6,000 native workmen and 120 European personnel. Of the workmen, 2,000 were engaged in mining. Production has increased from around 5,300,000 ct. per year to 12,000,000 ct. with an actual decrease in the labour force of approximately seven per cent, the result of the greater mechanization.

The total cost per man-month for native labour has been placed at Bfr. 1,200 (one Belgian franc equals U.S. $0.02). With 6,000 workmen and an average total output of 1,000,000 ct. per month, the average monthly output per man would be 167 ct., which apparently cost Bfr. 7.2 per ct. Assuming this to be 20 per cent of total direct cost, a cost of Bfr. 36 per ct. is indicated.

Taking the 1953 output and assigning to the gem and industrials the unit values given by the Service des Mines and subtracting the net operating profit shown in the balance sheet, a cost of Bfr. 32 results. The difference between sales and production could easily explain the small difference between these two figures. The cost of stripping was placed at Bfr. 26 per cu. m. With a 4 : 1 ratio of overburden to gravel and an average tenor of 9 ct. per cu. m. of gravel, this would be equal to Bfr. 11.56 per ct. If the total production cost is Bfr. 36, as it appears to be, then approximately one-third is for stripping. The other two-thirds are probably about equally divided between mining, concentration and final clean-up, including general charges against these operations.

Diesel fuel oil consumption at one period of 1954 was 200,000 litres per month; that of petrol was 100,000 litres. Costs of these were, respectively, 5 and 6.5 Bfr. per litre.

PLANS AND FUTURE OUTLOOK

Reserves are reported at 300,000,000 ct., or enough for 25 years' production and it is stated that plans call for stabilization of the output at about 12,000,000 ct. per year. As a result of the experience with sink and float in the clean-up plant, it has been decided to install a larger plant eventually, probably one of 1,000 cu. m. capacity day, for run-of-mine material after a preliminary log washing. Also, the possibilities of electrifying the LeTourneau units used to transport the diamantiferous gravel from the Disele pit to the washing plant is under investigation.

Considering that the Bakwanga output comprises at least 95 per cent industrials, this means that for the 29 year period the output has averaged about 4,900,000 ct. of industrials per year, or at least 61 per cent of the world average of 7,986,000 ct.

During 1953 Bécéka produced 12,056,057 ct. compared with outputs of 12,580,270 ct. and 20,200,000 ct. for the Congo and the World respectively. In that year, Bécéka thus produced 95.8 per cent of Congo production and 59.7 of world production.

ORE HANDLING—II.

Unloading Imported Ores at U.K. Ports

In the first instalment of the following article, which appeared in *The Mining Journal* of November 25, 1955, it was pointed out that the speed and economy with which the increasing tonnages of iron and manganese ores imported by the United Kingdom can be transported to the works, are major factors affecting British iron and steel production. While the initial portion of the article dealt more specifically with storage and hold space on ore carrying ships, the concluding instalment, appearing herewith, describes unloading equipment for dock installation. The findings discussed have arisen from the investigations on imported ore handling undertaken for the steel industry by the British Iron and Steel Research Association.

Another consideration when installing unloading equipment is the system adopted for transporting the ore from port to works. Rail transport is normally employed for this purpose and the ore is unloaded into wagons. Since ships arrive at irregular intervals, ports must be equipped with an unloading capacity which is high in comparison with the tonnage handled. If time in port is curtailed as a result of ample unloading capacity, the consequent gain can more than offset the loss occasioned by the fact that the berths and their equipment may be unoccupied for from one-third to one-half the time. In other words, quick turn-round of ships is more important than the continuous use of unloading equipment. An operational team set up by B.I.S.R.A. has calculated that the most economical results are achieved when ports are equipped with handling capacity equal to 1¼ - 2½ times the expected annual intake, depending on the size of the port.

The capacity of the equipment is determined primarily by the size of the grab. Small grabs, though still in service at some ports, are unable to deal effectively with the more difficult ores. B.I.S.R.A. considers that 10-ton grabbing cranes with four-rope grabs should be regarded as the minimum standard of equipment for such materials.

Slewing and luffing jib cranes are extensively used in many of the smaller ports. Provided they are of about 10-ton capacity and are equipped with suitable grabs, they can handle up to about 750,000 tons of imported ore annually. Four cranes are usually sufficient to handle a ship, the reason being that few ships in use have more than five hatches, and these are of different sizes. With one crane to each hatch the cranes would finish work at different times and much idle time would thus result. Unless the controlling hatch is large enough to allow two cranes to work it simultaneously, a five-hold ship can be unloaded with four cranes as quickly as with five by moving the cranes from hold to hold.

A 10-ton grabbing crane of modern design is almost invariable electrically operated and can usually be connected by flexible cable to any one of a number of fixed supply points on the wharf. To have an outreach of 50 ft., the jib must be about 80 ft. long, while the height of the crane is about 140 ft. A jib crane with a four-rope grab of about 75 cu. ft. capacity and a hoisting speed of 150 ft. per min. requires a hoist motor of about 150 h.p. and can pick up a load about once every 80 sec. At Newport docks a vessel containing 15,524 tons of Swedish ore was unloaded in 25¼ hours by 10-ton grabbing cranes.

ELIMINATION OF SLEWING

The cycle time of a large jib crane could be shortened if slewing could be eliminated. This has been achieved by the development of the kangaroo-type crane, which avoids slewing by always emptying its grab into a hopper fitted to the front of the crane structure. The average cycle time of a 10-ton crane is reduced by this means from 80 sec. to about 60 sec.

Kangaroo cranes have been in use for several years for handling coal, but so far the only port where they have been installed for iron ore is Tyne Dock. Part of the ore-handling scheme introduced by the Consett Iron Co., Ltd., in conjunction with the Tyne Commission and British Railways, comprises a quay equipped with five 10-ton kangaroo-type cranes each with a rated capacity of 300 tons an hour. This equipment is expected to handle up to 1,225,000 tons of ore a year. A system of belt conveyors transfers the ore to a row of overhead storage bunkers, below which are two rows of bunkers used for loading railway wagons. Ore is transferred from the storage bunkers by a scale car, which weighs out 28 tons into each loading bunker. When all loading bunkers in one row are full, they can be discharged simultaneously to fill a complete train of nine specially designed 56-ton side-discharge hopper wagons. On arrival at the Consett Iron Works these wagons are simultaneously discharged by opening the side doors, this being effected instantaneously by means of compressed air cylinders.

FACTOR OF WHARF SPACE

A disadvantage of general unloading equipment is the amount of wharf space occupied, which is usually too great to allow two machines to work in adjoining hatches of any but the largest ships. These machines are essentially faster than jib cranes of the same capacity. It is usual, therefore, to provide only two unloaders to a wharf, but a single berth equipped with two unloaders of 12 to 15 tons gross capacity is no faster than one equipped with four modern 10-ton cranes. Where the tonnage is sufficient to warrant more than one berth, however, ships large enough to accommodate more than two unloaders can be discharged very rapidly by putting all available unloaders on one berth.

In 1949 new plant comprising two 19-ton unloaders came into operation at Dorman, Long's South Bank Wharf, Middlesbrough. These two unloaders—the first machines in Britain exceeding 10-12½ tons—have a combined nominal capacity of about 1,000 tons an hour. At Port Talbot the Steel Company of Wales has installed three 25-ton unloaders and a fourth is under construction.

The discharge facilities being installed at Bidston Dock, Birkenhead, to handle the ore for John Summers and Sons will consist of two adjacent berths, each equipped with two 12½-ton unloaders. The first of these machines came into operation at the end of 1953. Each one is capable of discharging 350 tons an hour, but the normal rate is not expected to exceed about 200 tons an hour. Plans for improving the discharging facilities are also well advanced at other ports. They include schemes by Guest Keen Baldwins at Cardiff, and by Colvilles at the proposed General Terminus Wharf, Glasgow.

By building special ore-carrying ships of new design, installing new appliances, and introducing three-shift working at several ports, the industry succeeded in improving the daily average discharge rate by 30 per cent between 1949 and 1952. This progressive improvement has allowed B.I.S.C. (Ore) Ltd., in its charter party agreements with shipowners, to raise the guaranteed minimum daily rate of discharge from the 500 tons ruling pre-war to 1,500 tons.

Minerals Development in British Guiana

Existing knowledge of the mineral resources of British Guiana has been summarized in two recent reports published in Bulletins Nos. 25 and 26 of the British Guiana Geological Survey, price $3. Bulletin No. 25, *The Geology of British Guiana and the Development of its Mineral Resources*, has been compiled from official records by Dr. G. M. Stockley, director of the Geological Survey Department. Bulletin No. 26 has been presented by E. R. Pollard and C. N. Barron under title *The Bauxite Resources of British Guiana and their Development*, which incorporates in slightly re-arranged form most of the information in the *Memorandum on the Occurrence of Bauxite in British Guiana* presented as being gathered by D. W. Bishopp in 1937 and published in 1938 as Bulletin No. 8 of the Geological Survey. This memorandum was based mainly upon reports of investigations carried out between 1917 and 1921 by E. W. Winter under the direction of the late Sir John B. Harrison. The following article presents in précis the relevant details contained in Bulletins 25 and 26, in which the information from the earlier reports has been brought up to date by the incorporated data arising from subsequent investigations.

Though British Guiana has been no "El Dorado," the revenue accruing to the Colonial Government and to the Coast Colony from the exploitation of the territory's mineral wealth has amounted over the years to a very considerable sum. Minerals account for 30 per cent of the value of exports, 25 per cent of the total Government revenue, and nine per cent of the national income. The bauxite industry alone contributes about 20 per cent of the Colony's revenue.

Yet little indeed of the tax revenue derived from the mineral industry has been used to assist prospectors and miners in overcoming the difficulties presented by the lack of communications in the vast and almost uninhabited hinterland.

BAUXITE PRODUCTION

In 1954 British Guiana produced 2,309,919 tons of bauxite and was the world's largest producer. Over 90 per cent of the colony's output is produced by the Demarara Bauxite Company and most of the dried ore is exported to the Arvida plant of the Aluminium Company of Canada for conversion to metallic aluminium. Stockley considers it unlikely that further stages in the processing of bauxite beyond those of drying and calcining will be undertaken in the Colony, but it is expected that calcined ore will form a higher proportion of total production in the near future. Ore reserves are described as adequate to keep the industry at the present level of production for the next three decades.

Demarara Bauxite hold exclusive permissions for exploration covering an area of about 1,080,500 acres, of which only 25,880 acres are covered by mining leases. In round figures the ratio of land explored to orebodies is 50 : 1.

The present operational mines are Montgomerie and Maria Elizabeth, about five and eight miles south of Mackenzie respectively, "Planba" at Christianburg, and Topira and Warababaru at Ituni. Drilling is still being carried out on the Dorabece Deposit, immediately north of Montgomerie-Arrowcane, and it was hoped that overburden stripping would commence in 1955.

The overburden is continually increasing in thickness as mining progresses, due mainly to the rise of the ground surface away from the rivers and creeks near where mining first started. Demerara Bauxite find that the ratio of overburden which at present can be economically exploited is 4 : 1 ; they are not attempting to remove any overburden of more than 100 ft. thickness.

The Reynolds Metals Company took over the assets of the former Berbice Company at the end of 1952. Besides continuing mining and exploration in the Berbice District, the company is now carrying out active exploration in its new exclusive permission on the left bank of the Demerara River above the Mackenzie-Akyma area.

At present the only deposit being mined by the Reynolds Metals Co. is the "Ridge Deposit" situated about a mile from the Berbice River, which is normally referred to as "Kwakwani Mine". The sand overburden is very well suited to removal by the Euclid stripper-loaders employed. Since all the ore is shipped as metal grade, the mine can be worked in long parallel cuts. The advantages of a high grade of ore, combined with easily stripped overburden, convenient dumping sites, and the proximity of the mine to the river, are largely offset by difficulties of transportation. The company has nevertheless spent considerable sums on the mine, as well as on exploration and development of future reserves.

Gold production rose last year to 26,938 oz. compared with 20,966 oz. in 1953. In recent years interest has been centred chiefly on the operations of the Cuyuni Goldfields Co. Ltd. at Aurora Mine, situated near the Cuyuni River about 110 miles west of Georgetown. Development work on the Alec Hill orebody has indicated the existence of a mineralized ore-shoot about 1,000 ft. long, some 10 to 60 ft. wide, and at least 90 ft. deep below the crown of the hill. The ore-shoot appears to consist of alternating bands of mineralized decomposed schists and more or less barren clays. There are indications of the existence of other workable orebodies in the same area.

The future of the diamond industry in British Guiana may be largely dependent on the possibility of working alluvial deposits in the beds of the larger rivers by dredging. Interest is being shown in this possibility and preliminary prospections of the bed of the Kurupung River have recently been carried out by means of a diving helmet. Consideration is now being given to the use of a small "Spoon" or "Clam" dredge or scraper.

OTHER ACTIVITIES

During 1951 a local company, the Morabisi Mining Company, was formed to continue the exploration and development of columbite deposits in the Morabisi area. It is the only company in production, but prospecting is also being undertaken by the Columbium Corporation and San Francis Metals Ltd., both of U.S.A. Some prospections carried out in the Rumong-Rumong area showed that a crew of four men could excavate and pan an average of about 3,500 lb. of gravel a day, recovering 4½ lb. of columbite. In the Morabisi area it was estimated that there were 1,000,000 cu. yd. of material containing an average of 2 lb. of Cb_2O_5 concentrates per cu. yd. The grade was found to be better than 44.3 per cent Cb_2O_5 and 21.1 per cent Ta_2O_5.

Columbite has a wider distribution than was first thought. The Geological Survey has discovered workable deposits close to the Puruni River. Samples have come from the Cuyuni drainage area across the Mazaruni to the Essequibo and the Berbice River. Columbite has also been found in the middle and upper Waini River.

It is estimated that some 4,000,000-5,000,000 tons of manganese ore of 42 per cent Mn have been established on Matthew's Ridge near Araka in the North West District. Application for certain long-term leases has been made to the Government by the North West Guiana Mining Co., a subsidiary floated last year by African Manganese.

Coal Washery Supervision by Sound Equipment

A new supervisory system in a Scottish coal washing plant is one of the first in Britain to employ sound equipment for communication between one section of a coal washery and another. Loudspeakers and microphones at eleven key points in the washery make it possible for any stoppage anywhere to be made known immediately to every operator controlling or supervising machinery, and for the manager to give instructions which can be heard at once throughout every section of the plant. Apart from the obvious advantage of facilitating immediate action in an emergency the new system, supplied by The General Electric Co. Ltd. and described in the following article, effects a valuable general saving in time and labour.

The washery at which the sound equipment is installed, can handle 400 tons per hour with froth flotation and flocculation at a colliery in the Scottish Division of the N.C.B. The colliery feeds straight to the washery, and production goes on in spite of a washery breakdown. The washery manager must, therefore, be in a position to take steps at once to by-pass raw coal to the railway wagons unprocessed if necessary, to make a full appreciation of the emergency and give immediate orders to meet it.

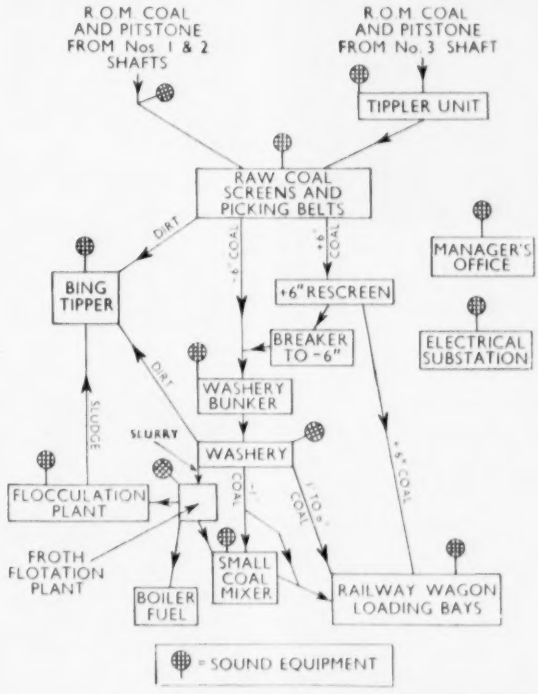
The sound equipment not only makes this possible, but also allows all operators' information to be heard simultaneously by all the other operators controlling or supervising machinery.

The equipment is particularly valuable in helping to overcome the difficulties caused by initial teething problems in a new plant.

The new system has proved so successful that it is now being extended to include the Colliery Manager's office.

MICROPHONE POINTS

At present microphone and loudspeaker points are sited in the Washery Manager's office, in the tippler unit, at the point where run-of-mine coal arrives from 1 and 2 colliery shafts, at the raw coal screens and picking belts. Other points are sited at the top of a spiral chute to the washery bunker, between the wash boxes in the washery, in the froth flotation plant, the small coal mixer, where filter cake is mixed with 1 in. coal and other products to become washed smalls for coking, the flocculation plant, the railway wagon loading bays, the hopper room of the bing tipper and the electrical substation.



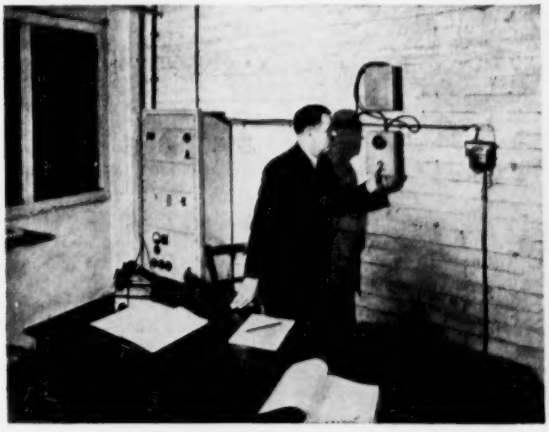
Simplified flow diagram of washery showing microphone and loudspeaker installations

SYSTEM CONTROL

The system is controlled by a single bay rack assembly in the manager's office. It incorporates a monitor loudspeaker panel for local testing and monitoring of the rack equipment. A special remote and local control panel switches the amplifier H.T. supply from the 11 parallel out-stations, while another panel supplies relays power.

The microphone equipments throughout the washery are steel-cased heavy duty microphone control units incorporating a moving coil microphone and a push switch. Each microphone is connected to the system by operating a push button. At the same time a relay is operated in the associated loudspeaker which silences it and thus prevents any acoustic feedback. The microphone switch also remotely switches the H.T. supply to the rack amplifier.

The twelve loudspeakers, which are of the re-entrant type, are stirrup-mounted so that the loudspeaker can be set at the angle which gives maximum projection efficiency.



Office rack assembly and microphone control unit

Microphone beside tippler unit

MACHINERY AND EQUIPMENT

Leather Belts for Mining Machinery Drivage

An Angus Double Northumbria leather belt, 15 in. wide, was recently supplied by George Angus & Co. Ltd. to drive a 6 ft.

The Angus Northumbria leather belt

dia. fan at Ravensworth Shop Pit, Co. Durham. The installation replaced a previous Angus Northumbria belt which had been operating for 17 years and was not new when installed.

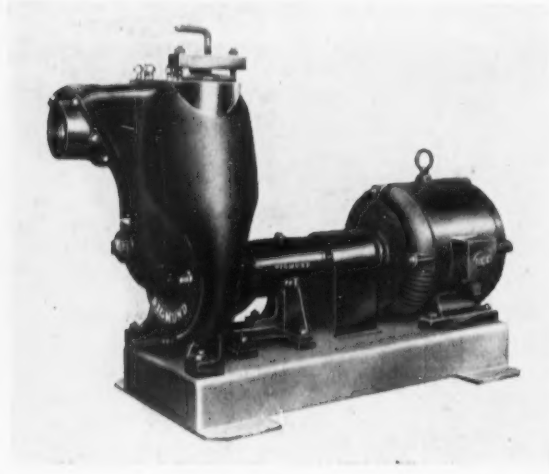
Drills at Kariba Project

Among other equipment supplied by Holman Bros., Ltd., 50 rock-drills have been ordered by civil engineering contractors engaged on the first stage of the Kariba Gorge hydro-electric scheme on the Zambesi, Southern Rhodesia. Equipment has already been supplied from the Company's large factory, and branches in Southern Africa.

Centrifugal Pumping Units

The centrifugal pumping units produced by Sigmund Pumps Ltd. are designed for operations in the oil refining and chemical industries, as well as in power stations and public utility applications. The pumps produced are manufactured for pressures up to 2,000 lb. p.s.i. at capacities of up to 50,000 g.p.m. and temperatures of 1,000 deg. F. maximum. The Sigmund range has a wide use within the mining industry.

Although production proper is carried out in a single building covering 150,000 sq. ft. at Team Valley, Gateshead, castings are produced in cast iron, alloy cast iron, and non-ferrous metals in the associate foundry at Middlesbrough. As a final link in the production chain, accurate examination of pumps with an output of up to 50,000 g.p.m. is carried out at a test and research station.

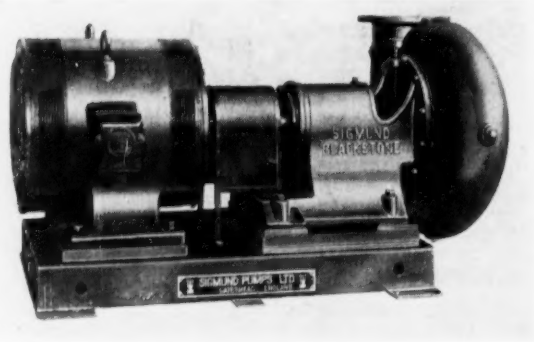


The Sigmund Type G pump

Among the pumping units so manufactured and tested is the Sigmund-Blackstone Type SB-B pump, a horizontal single impeller unit of particular application in coal washeries, coke works and for dredging. The manufacturers claim that where liquids with a content of solids and abrasive matter either choke or cause rapid wear in centrifugal pumps of standard design, the SB-B pump has proved to be capable of long periods of service.

Design features of these units include large waterways to permit free passage of solids, and complete protection of the shaft and bearings from the liquid handled. There is complete interchangeability of all components, and easy access to all parts of the unit.

The pump casing is constructed of close-grained cast iron, the volute embodying the discharge branch of the pump. The Sigmund-Blackstone "Unchokeable" impeller is of the single entry, double shrouded type, constructed of close grained cast iron. The water passages of the impeller are capable of passing large solids ranging from 1¼ in. to 13¾ in. diameter at 16 in. branch size. The supporting frame and bearing housing are of cast iron and are integral with the drive side of the pump casing.



Sigmund Unchokeable Horizontal Slurry Pump

The stuffing box and gland are of cast iron registered and bolted to the driving side cover of the casing, and the pump shaft is supported externally, there being no internal bearings in the pump and no contact between the bearings and material. The shaft is of high tensile steel, cast iron pulleys are generally used for the belt drive, and standard rotation is right hand. Ten pumps constitute the range, the smallest being the SB-B 2/12 and the largest the SB-B 16/28.

Automatic self-priming contractor's pumps produced by the same manufacturers are designated Type G, and include the GL2-CE, GA3-CE and GL6a-CE ranges, powered by petrol, and diesel engines of leading makes,

GL2-CE engines are of the industrial type, single cylinder 4 stroke and air cooled by a fan and cowling system. Petrol consumption is from 0.8 to 0.9 pints per B.H.P. hour. The GL2-CE and GL3-CE, both 1½ in. by 1½ in. units, provide a total head of 15 ft. to 55 ft. for the former and from 15 ft. to 80 ft. for the latter. G pumps can be used for handling lubricating oils, ammoniacal liquors, diesel and mineral oils, or dirty and muddy water containing abrasives. Suction lift is up to 25ft. under normal working conditions.

The four diesel engine-driven units of the GA3-CE group are of two basic sizes, 2 in. and 3 in., with maximum capacities of 8,000 and 20,000 g.p.h. against total heads of 60 and 150 ft. The GA3-CE group is useful for general applications in industry and will handle crude lubricating oils, ammoniacal

liquors and mineral oils. The GL6a-CE diesel powered range comprises two medium head self priming pumps with 6 in. and 8 in. branches for maximum outputs of 75,000 and 110,000 g.p.h. against maximum heads of 100 and 110 ft.

Instrument for Perspective Drawing

A Swiss manufacturer, F. Forster of Schaffhausen, has developed a new instrument named the Forster Perspective Automat which is presented as facilitating the fast and easy production of a perspective drawing from a plan and an elevation.

The Automat may be envisaged as having applications in the survey side of mining and quarrying, as well as in the machine and layout drawing vitally connected with the mining industry. The Perspective Automat is presented in *E.P.A. Technical Digest*.

By the use of an optional system the required height is fixed on the elevation and the plan is scaled with a graticule. The perspective points appear on the drawing paper and the complete design is obtained by joining up these points. Size of design is unrestricted. The instrument can be placed on any drawing table and enables untrained personnel to make perspective drawings.

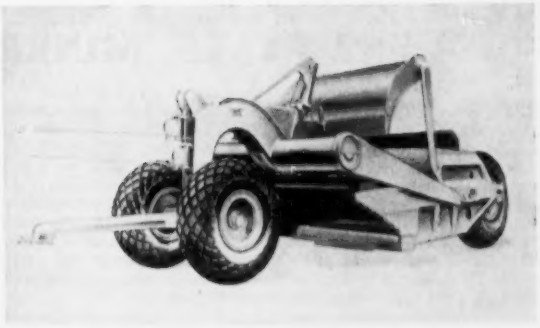
A Range of U.K. Caterpillar Lowbowl Scrapers

The Birtley Co. Ltd., announce that a new Caterpillar lowbowl scraper, the No. 463, will be available in the United Kingdom early next year. Two other recent Caterpillar lowbowl scrapers, the No. 456 and No. 470 models, are also to be manufactured by the Birtley Co. under licence with the Caterpillar Tractor Co. These three scrapers will replace the Caterpillar No. 80, No. 20 and No. 21 models, respectively.

The No. 463 is a crawler-drawn scraper having a struck capacity of 25 cu. yds. The longer, wider bowl of this new design gives the scraper greater volume and greater heaped capacity. Lower sides have been designed to give less loading resistance. Incoming material is not lifted so high into the bowl with the result that less resistance is caused by overhead weight. Low lifting height also reduces internal friction.

Lowbowl construction is designed to give a faster loading rate throughout the whole loading cycle. The higher apron lift and greater ground clearance of the No. 463 further contribute to loading and spreading efficiency.

The No. 456 and No. 470 scrapers are made to match the DW20 (Series E) and DW21 (Series C) tractor units. They also



The No. 463 crawler-drawn lowbowl scraper

have capacities of 18 cu. yds. struck and 25 cu. yds. heaped. An increase in ground clearance of 3 in. enables them to work in softer conditions, and nine more inches of apron lift provides for faster material ejection.

The scrapers, though built in this country by the Birtley Co., will be identical in every respect with the American-built units. This includes, where requested, the special 29.5 x 29 low-pressure tyres.

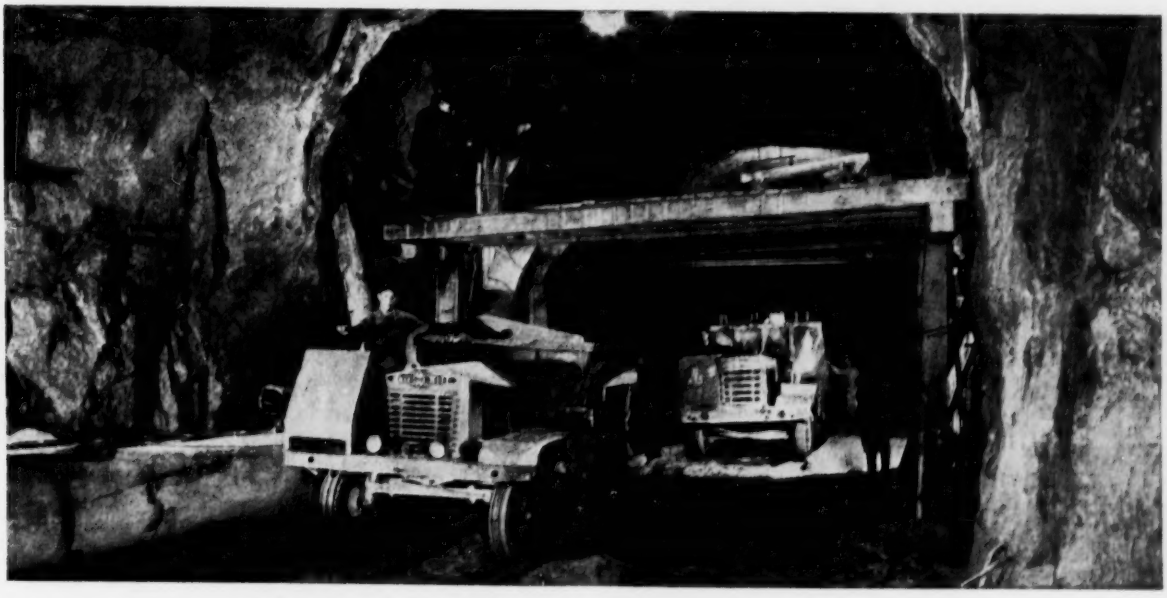
Dumpers in Portuguese Tunnelling Project

The Canicada tail race tunnel, which bores in a straight line from an underground power house, cutting off a large bend of the river Cávado, is one of Europe's most extensive tunnelling projects in recent years.

Part of a major Portuguese hydro-electric scheme, the tunnel is over 4½ miles long with a horseshoe cross-section of 22 ft. 4 in., involving the excavation of 300,000 cu. m. of granite, the tunnel being blasted in full cross-section.

In the two most important areas excavation has been carried out by Eimco 104 loading shovels mounted on diesel caterpillar tractors which transferred the excavated rock to a shuttle service of Muir-Hill Model 14B 4½ cu. yd. dumpers. The dumpers conveyed the tunnel spoil to shafts, where it was dumped into reception hoppers, hoisted by rail-guided skips and discharged into lorries on the surface.

During a period of 16 months this fleet of dumpers transported a total of 188,000 cu. m. from the tunnel and a further 11,000 from the equilibrium shaft. All the machines used on this important project were standard models.



A Muir-Hill dumper performing underground transportation duties at Caniçada

METALS, MINERALS AND ALLOYS

COPPER.—This week has been notable for the publication of two articles by Mr. R. L. Prain in *The Financial Times* on Tuesday and Wednesday discussing the outlook for copper. It will come as no surprise for those, who are familiar with the views of this eminent authority, to find that some of what he says is controversial. Indeed, had this not been so, the articles would have lost much of their quality. In the main, however, what he has written constitutes the most factual and objective statement of the copper position, which it has been our good fortune to read for a long time. These articles are required reading for all those concerned with copper.

Of particular interest is Mr. Prain's analysis of the sources of copper production and of the cost levels at which various segments of world production are currently produced. He estimates that about 10 per cent of world production comes from mines where copper is a by-product and consequently where its continued production will depend mainly on the price of metals other than copper. He estimates that a further 12 per cent of world production comes from mines in countries where the deposits are worked primarily from considerations of national policy rather than of economic production. This segment of production is consequently likely to remain unaffected by price fluctuations.

He next calculates that 72 per cent of world production comes from the main recognised copper producers, whose interests are primarily in copper and whose fortunes are consequently tied up with the copper price. He calculates that the spread of costs in this large group ranges all the way from 10 c. up to 30 c. per lb., although he believes that the largest single section within this spread (representing 25 per cent of world production) has costs falling between 15 c. and 17½ c.

Finally he attributes the remaining 6 per cent of world production to small mines whose production costs are mainly unknown, although many of them are presumed to have a break even point of above 30 c.

Taking the world's copper production as a whole Mr. Prain estimates that 50 per cent of it is now produced at a cost of less than 15 c., 75 per cent below 17½ c. and 90 per cent below 25 c. He concludes from these figures that the price of copper could fall by £150 a ton from its present level without causing a loss in production of more than about 10 per cent. In other words an overwhelming majority of copper producers could see the price down to well below 30 c. and still make a profit. This, however, is not to say that there would be no falling off in production before this level was reached because, as Mr. Prain observes, "experience has shown that some producers may voluntarily curtail production at some point above this." In this connection it will doubtless be recalled how readily with the price at 30 c. U.S. copper producers cut back domestic production in the early months of last year at a time when accumulated stocks of Chilean copper appeared a dangerous threat to world markets.

As regards future production Mr. Prain forecasts an increase of 426,000 s.tons of new copper per annum by the end of 1957 and a further increase of a 160,000 s.tons by 1960. Beyond this he anticipates that within this next year or two there should be a substantial reduction, which he puts at 100,000 tons in the amount of copper bought annually by the U.S. stockpile. Finally he points out that during 1954 and 1955 there have been exceptional production losses, due to strikes, of 128,000 and 145,000 s.tons respectively and he concludes that it would be reasonable to assume an average annual loss from this cause of not more than about 65,000 tons. This gives us an overall picture of additional primary copper availability amounting to about 590,000 s.tons by the end of 1957, and about 750,000 s.tons by 1960.

As to whether or not this very substantial additional tonnage can be consumed within this period, Mr. Prain gives it as his opinion that within the next decade a tonnage of this magnitude could be absorbed assuming an unimpaired progress in the statistically probable growth factor for copper based on trends in population in steel output etc. This assumption, however, presupposes that the natural rate of growth is not impaired by loss through substitution of competing materials. Here he considers the copper price level to be of major importance. He expresses the view that with copper at 30 to 35 c. per lb. the danger of substitution would greatly diminish and that the growth factor of copper would then be maintained and would require the opening up of more mines as time goes on.

Inevitably Mr. Prain devotes some attention to the copper price mechanism. In this context he rightly points out that most of the world's producers are to-day selling on some price basis other than that of the London Metal Exchange—usually on some fixed price basis determined for varying periods ahead. At the same time he makes it clear that he does not regard a post-war L.M.E. price as a satisfactory basis for pricing copper (at any rate under present conditions) owing to its extreme volatility. He describes the L.M.E. as an ultra-sensitive market, which while on the whole an accurate barometer of tendencies is either on a rising or a falling market—usually ahead of other world quotations.

No-one will deny that the post-war L.M.E. copper market has been thin (due to various familiar causes which Mr. Prain lists), nor that this has been the main cause of the excessive fluctuations in L.M.E. prices. What however does not emerge from Mr. Prain's articles is how we might set about pricing copper more accurately by some other yardstick. As we see it, the price of copper is the price you have to pay for the metal if you want more and haven't got it. It is not the price that somebody else is paying for copper by virtue of a long term agreement, nor is it the price at which for convenience it is being transferred from one associated company to another. However convulsively the L.M.E. has shown its ability to determine an effective price and there is no getting away from the fact that earlier this year during a period of acute copper shortage in the States, adequate tonnages of copper were reaching this country due to there being a market in London which was sensitive to free market influences.

Mr. Prain's concept of an acceptable price would, however, appear to be somewhat different. To him, such a price should be "representative", that is to say, should be mathematically computed average of the prices at which varying tonnages are changing hands, and he expresses regret that no single quotation is published to-day which accurately reflects this mathematical composite. Presumably the *E. and M.J.* domestic and export quotations together come nearest to this ideal, but it seems pertinent to point out that any price arrived at on such a basis can be only of historical interest in that it reflects the weighted average price at which copper has been sold over the past week or month (much of it under anything but free-market conditions), and consequently it does not indicate the price which a buyer coming into the market *to-day* has had to pay in competition with his fellows.

Whatever pricing system is adopted, the great bulk of copper will continue to pass from seller to buyer without going through any sort of market. What, however, both parties need is a satisfactory basis upon which to price these shipments week by week. An historical index is useless for this purpose as it merely reflects what may already be a distorted picture. Consequently in the absence of some other free market promising a more satisfactory quotation it remains our view that the most useful contribution, which all exporting copper producers and their principal customers alike could make to this problem, would be to agree to pass a sufficient tonnage of metal through the L.M.E. to ensure that it becomes a less erratic market index, rather than to try to devise some alternative.

LEAD.—As things have turned out, the rise in the London lead price never quite reached the point of attracting foreign producers away from the New York market (a firm basis of £112 per ton would be required), and with the London price subsequently easing again, the likelihood of any increase in New York above the 15½ c. level has receded. Nevertheless, lead has been in active demand in New York with large consumers reported to be buying in advance for December at 15½ c., which suggests that at best they do not see the price going any lower.

The present tight position has apparently been complicated by certain producers being forced into the market to cover sales contracts falling. The present situation appears to be attributable in parts to the prolonged strike last July and August at the A.S. and R. plants and also to the hurricanes and floods in Mexico which curtailed Mexican refinery production through a hold up in fuel supplies.

U.S. imports of refined lead of the first nine months of this year have dropped to 193,439 s.tons compared with 222,553 s.tons for the corresponding period last year.

Based on figures for the first nine months, lead consumption in the States this year is expected to reach about 1,170,000 s.tons, that is to say, about 7 per cent better than 1954. Meanwhile, the A.B.M.S. reports that October shipments to the home market were, at 52,062 s.tons, the highest since November, 1950.

TIN.—It is rumoured in Washington that there have been several promising "expressions of interest" in the Texas smelter, which the Administration has expressed its desire to sell next June. Final approval for any action in this direction

will have to come from Congress and it is thought that no firm offers will be forthcoming until this stage has been reached. One of the problems on which producers are going to require some reassurance concerns the likelihood of those mines, which are at present supplying the smelter, being ready to continue to do so on the expiry of government contracts. These at present run until the following dates: Bolivia—April 30 next; Indonesia —March 20; Thailand and Congo—March 31.

An unconfirmed report from La Paz states that the Williams Harvey smelter has concluded a contract for the purchase of 50 per cent of Bolivia's tin production for five years from January next. William Harvey has long been the recipient for practically all the output of the ex-Patino mines, and this new contract is presumably a renewal of the one now running.

The Nigerian tin miners have accepted an offer by the employers to pay a minimum daily rate of 2s. 8d. The employers have also offered increases to special categories of worker, which have not as yet been accepted by the unions. It would appear from the *Reuter* message announcing this agreement that the new minimum rate does not incorporate the maize subsidy and that this will no longer be paid.

ZINC.—The forward price for zinc has firmed up this week and by Wednesday had touched £94. Presumably at around £96 the St. Louis price will have to go better to hold the foreign producers' interest.

American zinc demand is stated to be remaining firm with the very high level of steel mill output an important factor for prime western grades. Special high grade zinc is as tight as ever, and the 1¼ c. premium on the four-nines grade became fully effective on December 1 for all regular producers.

In this column on October 28, we attributed to the American Zinc Institute the energetic protest made on behalf of consumers in connection with the abortive attempt by some U.S. producers to advance their price to 13¼ c. This protest, in fact, emanated from the American Die Casting Institute.

ALUMINIUM.—Primary Canadian production this year is likely to fall short of estimates by about 45,000 s.tons as compared with the programmed figure of 650,000 s.tons. Part of this loss is attributed to a temporary power failure at Kitimat earlier in the year, but more relevant appears to be the recent power shortages in the Saguenay district due to abnormal water and weather conditions. It is feared that another 35,000 tons may be lost from production in this area by next spring, although thereafter the situation should ease with Kitimat's expanding production. In consequence of this Alcan has had to establish an allocation system and it is anticipated that total distribution during 1955 will work out somewhat as following: U.K. 265,000 tons; U.S.A. 193,000 tons; Canada 83,000 tons, others 64,000 tons.

TITANIUM.—The price of titanium sponge has again been cut. On this occasion the lead was taken by the Titanium Metals Corporation who knocked down their price 30 c. per lb. for A.1 grade, thus making their new price $3.45. Subsequently this move was followed by Dupont who are also now quoting the new price. Titanium Metals ascribe their price cut to growing efficiency in production and also, we would imagine, to expanding production.

British Titan Products is shortly sending out a team of experts to Sierra Leone to study the possibility of working the titaniferous deposits of the Bonthe and Moyambe districts.

URANIUM.—The rich uranium strike in the Buller Gorge on the west coast of the South Island, New Zealand, reported in our November 18 issue, has turned out to be highly suspect. Reports now reaching this country state that on investigation the uranium lode appeared to be "patchy" and not a commercial proposition. However, further checks are to be made and if a cross-section of the lode was found to contain as much uranium as the original samples, trenching and prospecting would be justified.

The London Metal Market

(From Our Metal Exchange Correspondent)

Pride of place this week has been taken by the zinc market which has risen over £3: activity has been fairly general, but consistent demand for the near position has been one of the main reasons for the advance which is not expected to go further unless a move is made in the States to increase the price there. Demand for high-grade zinc continues excellent, and some quarters are experiencing difficulty in obtaining enough. On the other hand g.o.b. is plentiful with prices in Europe being a little under the L.M.E. level, but it is understood that demand for this grade has also shown improvement recently.

Tin has again been a fairly active market, prices have risen further, and the undertone remains firm. The situation in Malaya is still sufficiently unsettled to be considered a "bullish" factor. On Thursday morning the Eastern price was equivalent to £783¼ per ton c.i.f. Europe.

The lead market has remained steady with the backwardation almost disappearing at the end of the month, and as the expected rise in America has not taken place it is felt the present price level will be barely maintained.

The copper market has been fairly active, but with a little more cash copper on offer the backwardation has narrowed slightly and some people consider that this tendency may go on. The price level itself has again increased but without any apparent justification on this side of the Atlantic. In America demand has increased and consumers are now purchasing so-called "premium" copper for delivery during January, and some are even covering in their first-quarter's requirements. There appears, however, little chance that the producers will raise their price, and therefore with continually increasing supplies the market for "premium" copper must disappear before long.

Closing prices and turnovers are given in the following table :—

	November 24		December 1	
	Buyers	*Sellers*	*Buyers*	*Sellers*
Copper				
Cash	£384¼	£385	£384	£385
Three months	£374¼	£375	£374	£375
Settlement	£385		£385	
Week's turnover	6,300 tons		3,600 tons	
Tin				
Cash	£775	£776	£788	£789
Three months	£765	£766	£776	£777
Settlement	£776		£789	
Week's turnover	450 tons		620 tons	
Lead				
Current half month	£109¾	£110	£109½	£110
Three months	£109¼	£109½	£109¼	£109½
Week's turnover	5,800 tons		3,300 tons	
Zinc				
Current half month	£93	£93¼	£95	£95¼
Three months	£91½	£92	£93¼	£93½
Week's turnover	4,025 tons		4,350 tons	

OTHER LONDON PRICES — DECEMBER 1

METALS

Aluminium, 99.5%, £171 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £210 per ton
Crude (70%) £200 per ton
Ore (60% basis) 23s. 6d./24s. 6d. nom. per unit, c.i.f.
Bismuth
(min. 1 ton lots) 16s. lb. nom.
Cadmium 11s. 6d. lb.
Chromium, 6s. 11d./7s. 4d. lb.
Cobalt, 21s. lb.
Gold, 249s. 8d.
Iridium, £30 oz. nom.
Manganese Metal (96%-98%) £269 according to quantity
Magnesium, 2s. 4d. lb.
Nickel, 99.5% (home trade) £519 per ton
Osmium, £24/27 oz. nom.
Osmiridium, £40 oz. nom.
Palladium, £7 10s./£8 0s. oz.
Platinum U.K. and Empire Refined £32 10s. oz. Imported £41 0s. oz.
Rhodium, £40.
Ruthenium, £17 oz.
Quicksilver, £88 10s./£90 0s. ex-warehouse
Selenium, 72s. nom. per lb.
Silver, 77¼d. f.oz. spot and 77½d. f'd.
Tellurium, 15s./16s. lb.

ORES, ALLOYS, ETC.

Bismuth	30% 5s. 0d. c.i.f. 20% 3s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semi-friable) 48%	£15 2s. 6d. per ton c.i.f.
,, Refractory 45%	£14 2s. 6d. per ton c.i.f.
,, Smalls 42%	£12 2s. 6d. per ton c.i.f.
Magnesite, ground calcined	£26-£27 d/d
Magnesite, Raw	£10-£11 d/d
Molybdenite (85% basis)	105s. 0d.-108s. 0d. per unit c.i.f.
Wolfram and Scheelite (65%)	245s. 0d./250s. 0d. c.i.f.
Tungsten Metal Powder (98% Min. W.)	19s. 10d. nom. per lb. (home)
Ferro-tungsten (80%-85%)	16s. 10d. nom. per lb. (home)
Carbide, 4-cwt. lots	£39 3s. 9d. d/d per ton
Ferro-manganese, home	£54 10s. 0d. per ton
Manganese Ore Indian c.i.f. Europe (46%-48%) basis 100s. freight	84d. per unit c.i.f.
Manganese Ore (38%-40%)	69d. per unit
Brass Wire	3s. 6½d. per lb. basis
Brass Tubes, solid drawn	2s. 11½d. per lb. basis

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

Stock exchange activity in the past week can best be described as ticking over. Certain specific sections, notably oils, remained firm. In this case, the steadily increasing consumption has outweighed the bearish factors of strong competition and the need for large scale capital development during the next few years.

Kaffirs were depressed and prices continued to slide downwards. This was again mainly caused by lack of interest. In the finance house group, Johannesburg Consolidated fell back on further consideration of the cut in dividend and chairman's general remarks. Anglo-Transvaal Consolidated were firm. The detailed figures show that the company is now in a healthier position than some years ago and the steady dividend policy, coupled with a yield of about 9 per cent, were contributing factors.

Among individual Rand mines, falls predominated. French buying of Blyvooruitzicht and good technical progress made by Buffelsfontein kept these shares steady. The announcement by the chairman of Dominion Reefs that it was hoped to declare an interim dividend in the near future caused some recovery although the overall position was weaker. Government Areas were one of the few features to show some improvement due to hopes of an increased distribution. Some speculative attention was also paid to Springs, this old property has managed to reduce its working costs by closing two shafts and coal deposits on the mine are being examined.

Initial resistance in the Orange Free State group was not sustained and fairly heavy declines took place. Lack of details concerning the new area being investigated by Freddies caused a setback in the shares and rumoured shop support of Free State Geduld did little more than steady the decline in this stock.

West Africans were again idle and the position was not helped by the deadlock in the wage negotiations for miners on the coast. There was some speculative demand for Konongo now ex 1s. a share capital repayment. Developments in the Boabedroo area raised these hopes. There is some fear that the Taquah mine may suffer flooding due to the strike of maintenance men.

In the diamond and platinum section, Consolidated African Selection Trust fell on the news that there was a strike of native labour at the Gold Coast property, but De Beers hardened due to press reports of a current diamond shortage in the world and the company's plans, in conjunction with Imperial Chemical Industries, to start an explosives works in Southern Rhodesia. Platinums also hardened on the better demand for the metal and the news that Rustenberg are seeking a new lease adjoining their present property.

In the copper market, prices mostly drifted due to fears that the present metal price may not be held during the coming months. Special features were a jump in Rhodesia Katanga which touched 29s. on Wednesday. Magundi Copper and North Charterland also hardened following reports that a rich strike of copper ore had been found in the area now being prospected. Financing arrangements for Esperanza, coupled with the strengthening of the existing Board, brought about a rise in these shares despite the situation in Cyprus.

The high price of tin left most of the individual Malayan mines unchanged although there was some selective demand for properties with large ore reserves. In this respect, Kamunting went ahead but the news that Tekka Taiping had decided to make a 2s. 6d. capital return per share failed to stimulate the stock. Public interest was mainly confined to British Tin Investment and London Tin, both of which went ahead. The pessimistic review by the chairman of Jantar with regard to the immediate prospects of columbite caused a drop in these shares with a sympathetic easing of Amalgamated Tin.

The record high price of lead and zinc was reflected by the improvement in Barriers, Consolidated Zinc and New Broken Hill being the principal beneficiaries. Mount Isa were virtually unchanged due to the cessation of smelting of lead and copper. This was caused by the strike of railmen handling coal to the property.

Finance	Price Nov. 30	+ or — on week
African & European	3	-⅛
Anglo American Corpn.	8⅛	-⅛
Anglo-French	22/9	+3d
Anglo Transvaal Consol.	27/6	.....
Central Mining (£1 shrs)	42/9	-9d
Consolidated Goldfields	56/3	-7½d
Consol. Mines Selection	37/6	-1/3
East Rand Consols	1/10½	.....
General Mining	4¼	-¼
H.E. Prop.	7/9xd	-1½d
Johnnies	39/6	-2/-
Rand Mines	3¼	-⅛
Rand Selection	41/10½	-1/3
Union Corporation	45/6	-1/6
Vereeniging Estates	4¼	-⅛
Writs	37/6	-7½d
West Wits	39/9	.....
Rand Gold		
Blyvoors	25/9	.....
Brakpan	6/1¼	-7½d
Buffelsfontein	27/6xr	.....
City Deep	11/9	-3d
Consol. Main Reef	20/7½	-7½d
Crown	2⅜	-⅛
Daggas	2⅜	-⅛
Dominion Reefs	25/-	-1/3
Doornfontein	23/3	-9d
Durban Deep	30/7½	-1/3
E. Champs	4/-	-6d
E. Daggas	9/9	-3d
E. Geduld (4s. units)	29/9	-1/-
E. Rand Props.	2⅛	-⅛
Geduld	4¼	-⅛
Govt. Areas	6/6	+3d
Grootvlei	22/-	-9d
Hartebeestfontein	36/-	-1/9
Libanon	7/10½	-1½d
Luipaards Vlei	18/3	-6d
Marievale	21/-	-6d
New Kleinfontein	6/-	-3d
New Pioneer	12/3	-9d
Randfontein	46/9	-2/-
Robinson Deep	16/6	-3d
Rose Deep	10/6	.....
Simmer & Jack	3/10½	-1½d
S.A. Lands	23/1½	.....
Springs	3/9	-1½d
Stilfontein	26/-	-1/-
Sub Nigel	35/7½	-1/10½
Vaal Reefs	31/3	-9d
Van Dyk	3/3	-3d
Venterspost	13/6	-6d
Vlakfontein	17/3	-9d
Vogelstruisbult	29/9	-3d
West Driefontein	5⅛	-¼

Rand Gold contd.	Price Nov. 30	+ or — on week
W. Rand Consolidated	38/1½	-7½d
Western Reefs	34/6	-1/9
O.F.S. Gold		
Freddies	7/10½	-7½d
Freddies Consolidated	3/10½	-1½d
F.S. Geduld	3⅜	-⅛
Geoffries	14/-	-1/-
Harmony	27/9	-1/-
Loraine	6/-	-3d
Lydenburg Estates	15/7½	-1/3
Merriespruit	10/3	-1/3
Middle Wits	13/-	-1/1½
Ofsits	58/9	-3/9
President Brand	63/9	-1/3
President Steyn	34/9	-1/-
St. Helena	26/9	-1/-
Virginia Ord.	11/-	-7½d
Welkom	17/-	-1/3
Western Holdings	3⅜	-¼
West African Gold		
Amalgamated Banket	2/-	.....
Ariston	5/9	-1½d
Ashanti	21/4½	-1½d
Bibiani	4/-	.....
Bremang	1/7½	.....
G.C. Main Reef	2/6	.....
Konongo	2/4½	+1½d
Lyndhurst Deep	1/4½	-1½d
Marlu	7½	.....
Taquah	1/6	-1½d
Western Selection	8/9	.....
Australian Gold		
Gold Mines of Kalgoorlie	12/6	.....
Great Boulder Prop.	10/7½	+1½d
Lake View & Star	16/-xd	-3d
Mount Morgan	21/9	+3d
North Kalgurli	7/-	+3d
Sons of Gwalia	3/4½	-1½d
Western Mining	8/9	-3d
Miscellaneous Gold		
Cam & Motor	8/6	-4½d
Champion Reef	5/9	.....
Falcon Mines	6/4½	-1½d
Globe & Phoenix	25/-	.....
G.F. Rhodesian	8/7½	-3d
Motapa	1/1½	.....
Mysore	3/-	+1½d
Nundydroog	8/-	.....
Oorogum	4/3	.....
St. John d'El Rey	16/6	-2/9
Zams	55/-	-7½d

Diamonds and Platinum	Price Nov. 30	+ or — on week
Anglo American Inv.	9¼	.....
Casts	27/6	-1/-
Cons. Diam. of S.W.A.	7½	.....
De Beers Defd. Bearer	6⅞	+⅛
De Beers Pfd. Bearer	16¼	-⅛
Pots Platinum	12/3	.....
Watervaal	18/6	+3d
Copper		
Bancroft	37/9	-2/3
Chartered	75/-	-1/-
Esperanza	4/-	+3d
Messina	8½	.....
Nchanga	14⅛	-⅛
Rhod-Anglo-American	5½	-⅛
Rhod-Katanga	27/6	+6d
Rhodesian Selection	46/-	-2/-
Rhokana	41/-	-1d
Rio Tinto	3½	-¼
Roan Antelope	24/7½	-9d
Selection Trust	4⅛	-⅛
Tanks	8½xd	-⅛
Tharsis Sulphur Br.	6¼	-¼
Tin (Eastern)		
Ayer Hitam	24/6	-3d
Gopeng	9/6xd	-3d
Hongkong	8/-	+3d
Ipoh	21/10½	.....
KanuKamunting	10/3	+3d
Kepong Dredging	3/3	-1½d
Kinta Tin Mines	17/6	+6d
Malayan Dredging	10/-	-1½d
Pahang	12/6	.....
Pengkalen	11/9	+3d
Petaling	10.1½	+1½d
Rambutan	21/10½xd	-1½d
Siamese Tin	8/10½xd	-7½d
Southern Kinta	17/6	-3d
S. Malayan	8/4½xd	-7½d
S. Tronoh	8/3	.....
Sungei Kinta	16/3	.....
Tekka Taiping	8/7½	-3d
Tronoh	9/3	+1½d
Tin (Nigerian and Miscellaneous)		
Amalgamated Tin	12/3	-1½d
Beralt Tin	38/-	+1/-
Bisichi	5/6	+1½d
British Tin Inv.	26/-	+1/6
Ex-Lands Nigeria	2/6	.....
Geevor Tin	15/1½	+4½d

Tin (Nigerian and Miscellaneous) contd.	Price Nov. 30	+ or — on week
Gold & Base Metal	1/10½	-1½d
Jantar Nigeria	6/9	-6d
Jos Tin Area	15/-	+3d
Kaduna Prospectors	2/-	.....
Kaluna Syndicate	2/10½	-1½d
London Tin	9/4½	+1½d
United Tin	1/9	.....
Silver, Lead, Zinc		
Broken Hill South	56/10½	-1½d
Burma Corporation	2/10½	+1½d
Consol. Zinc	56/3	+3/9
Lake George	14/7½	+7½d
Mount Isa	62/-	+3d
New Broken Hill	44/3	+3/6
North Broken Hill	82/6	+7½d
Rhodesian Broken Hill	14/3	+1½d
Uruwira	6/-	+1½d
Miscellaneous Base Metals and Coa		
Amal. Collieries of S.A.	51/9	+6d
Associated Manganese	36/9	-1/9
Cape Asbestos	10/3	+3d
C.P. Manganese	32/6	.....
Consol. Murchison	66/10½	+1/10½
Natal Navigation	3⅛	.....
Turner & Newall	104/9	+2/6
Wankie	18/7½	+7½d
Whitbank Colliery	5⅛	+⅛
Canadian Mines		
Dome	$29	.....
Hollinger	$35½xd	-¼
Hudson Bay Mining	$114	.....
International Nickel	$143	+2¼
Mining Corpn. of Canada	£7⅛	-¼
Noranda	$93	+½
Quemont	£9½	-¼
Yukon	4/1½	.....
Oil		
Anglo-Iranian	5¼	-⅛
Apex	35/-	+2/9
Attock	39/-	.....
Burmah	3⅜	+⅛
Canadian Eagle	52/-	+6d
Mexican Eagle	23/-	-3d
Shell	7¼	-¼
Trinidad Leasehold	41/-	+1½d
T.P.D.	27/6	.....
Ultramar	34/3	+6d

COMPANY NEWS AND VIEWS

Mount Isa's Expansion

Generally speaking, output of metals by Mount Isa Mines of Queensland, Australia, showed a marked expansion during the financial year ended June 30, 1955. A point of particular interest was the company's copper production which reached 21,585 tons as compared with 19,869 tons during the previous year and only 5,477 tons during 1952-53.

Year to June 30	Tons ore milled Cu. (000)	Pb. (000)	Recovery grades* Lead %	Zinc %	Silver (oz. per ton)	Copper %
1955	573.7	670.5	7.8	5.9	6.1	3.8
1954	566.0	645.1	7.4	6.3	5.7	4.2

* Metals produced :
Lead bullion 39,730 tons (1953-54 35,725 tons). Zinc concentrate 36,415 tons (1953-54 40,198 tons). Silver 3,370,920 ozs. (1953-54 2,872,493 ozs.). Blister Copper 21,585 tons (1953-54 19,869 tons). Lead Dross 4,866 tons (1953-54 3,778 tons).

Reflecting this improvement in productivity, total revenue earned moved up sharply. But expenses of mining, milling, and smelting also advanced to £8,554,739 from £6,860,439. Despite this sizeable increase, however, net profit was well up over that of the preceding year. Dividends paid on an issued ordinary capital of £5,757,312 were accordingly raised to 25 per cent from 20 per cent.

Year to June 30	Total Revenue £000	Expenses* £000	Net Profit £000	Dividends £000	To Reserve £000	Carry Forward† £000
1955	13,847.8	10,540.6	3,307.2	1,439.3	1,000.0	1,593.5
1954	10,579.5	7,483.3	2,096.3	1,151.5	NIL	1,725.6

* Including £941,250 (£520,000 for taxation).
† After appropriation for general capital expenditure and development £1,000,000 (£600,000).

During the past financial year development work was carried out at the maximum rate possible with the object of determining the ore potential of the mine both in lead and copper. A total of 51,642 ft. was advanced as compared with 39,058 ft. during the previous year while diamond drilling from the surface to test for extensions from the copper lode amounted to 50,978 ft. as against 30,858 ft.

The company's year-end estimate of ore reserves revealed a most satisfactory position and represented substantial advances over those of the previous year. In the lead-zinc section 12,200,000 tons existed containing 8.5 per cent lead; 6.2 per cent zinc and 6.1 oz. of silver per ton. In the copper section ore available amounted to 5,100,000 tons which had a grade of 4 per cent copper.

At their present price Mount Isa £1 shares stand at around 62s. x.d. and yield about 6¼ per cent. Bearing in mind that current development work indicates a potential for the mine which has, as yet, not been reached this price is not excessive.

Mr. G. R. Fisher is chairman. Meeting, Brisbane, Australia, December 6.

New Union's Dividend Policy

The consolidated balance sheet of New Union Goldfields as at June 30, 1955, disclosed quoted investments at a market value of £3,254,073. This figure compares with £2,467,656 in respect of 1954. The book entry of these holdings was £2,259,661 as against £1,870,831. Unquoted securities were shown at £599,864 as compared with £405,038. Net liquid assets of the group amounted to some £66,000 in contrast with the preceding year's deficit under this heading of about £43,000.

The main feature of the group profit and loss account in respect of the past financial year was a profit of £338,862 (£106,357) from realization of investments. The whole of this sum did not, however, show up in total revenue earned because £144,389 (nil) was at once transferred to investment and property reserves. Despite this, the fall to £40,240 from £69,925 in receipts from investments was more than offset.

Yeat to June 30	Total Revenue £	Expenses* £	Taxation £	Net Profit £	To Reserve £	Carry forward £
1955	250,326	34,018	6,559	187,460	170,000	84,698
1954	239,996	72,034	10.721	191,805	382,748	63,081

* Administration only.

Referring to prospects for the current financial year, Lieut.-Colonel R. L. Broad, the chairman, stated that due to larger distributions by the group's associated companies, New Witwatersrand Gold Exploration and Lydenburg Gold Farms, dividend receipts for 1954 show some improvement. Dominion Reefs would, in addition, probably start payments.

Owing to the present strain on New Union's financial resources, Lieut.-Colonel Broad did not, however, foresee an early resumption of dividends from New Union itself. But the position was improving and he hoped that if not next year, then the year after that, dividends on a modest scale might re-commence. Meeting Johannesburg, December 14.

Drop in Goldfields Rhodesian's Sharedealing Profits

A drop in profits from sales of investments to £23,866 from £44,330 took place during Goldfields Rhodesian Development Co.'s financial year ended May 31, 1955. Income from investments brought in £38,208 as against £40,572; interest £6,611 as against £10,304 while sundry revenue at £2,077 compared with the previous year's figure of £4,174. After tax of £17,081 (£18,260) and dividends which absorbed £36,142 (£34,570) unappropriated profits carried forward moved up to £24,503 from £16,005. This was mainly due to a taxation refund of £20,427 (£19,944).

As previously announced, The Consolidated Gold Fields of South Africa are negotiating for the acquisition of the company's shares. It is expected that an offer will be made on or about December 12 at which time full details will be sent to shareholders.

Mr. Robert Annan is chairman. Meeting, London, December 20.

Casts' Diamond Sales Fall by About 5 Per Cent in 1954-55

The Directors' report of Consolidated African Selection Trust stated that total value of diamond sales from both the Gold Coast and Sierra Leone was about 5 per cent less during the year ended June 30, 1955, than in previous years. Operating costs in Sierra Leone, the report continued, were still rising. This was to some considerable extent due to increases in subsidies for foodstuffs supplied to Africans and to expenses of security measures. Costs of production on the Gold Coast had remained approximately unchanged. Thieving and illicit mining, the report stated, in both the Gold Coast and Sierra Leone continued to present a serious problem.

During the past financial year total consolidated revenue earned by Casts declined to £2,067,447 from £2,227,957. Taxation amounted to £1,174,750 (£1,412,000) and a sum of £351,945 (£380,546) was placed to reserve. Dividends absorbed £654,014 (£625,579) and the balance carried forward moved up to £359,805 from £323,067.

Current assets shown on the consolidated balance sheet declined to £5,675,170 from £6,199,607 but current liabilities also decreased to £2,024,151 from £2,566,760.

Casts' meeting will be held in London on December 15, after which the speech of the chairman, Mr. A. Chester Beatty, will be circulated to stockholders.

Dominion Reefs May Pay Interim in December

In his statement to shareholders of Dominion Reefs (Klerksdorp), Lieut.-Colonel R. L. Broad, the chairman, said that there was every possibility of being able to re-commence dividend payments with an interim declaration in December, 1955.

Referring to the recent decision to supplement dump ore by resuming underground mining operations, Col. Broad intimated that capital expenditure for this purpose would have to come from the company's own resources. Although, in addition, Dominion Reefs had an accumulated loss of some £230,000, it was not intended to allow these factors unduly to delay the resumption of dividend payments.

Meeting, Johannesburg, December 30.

Lonrho's Share Dealing Profits

The most notable feature of London and Rhodesian Mining and Land Company's consolidated profit and loss account in respect of the year ended June 30, 1955, was a sharp rise to £30,752 from £17,036 in profits from sharedealing. As the company's portfolio has tended to become more stabilized in recent years, profits from this source have been expected to fall away rather than advance. The sharp gain will, therefore, be well received.

Profits after taxation made by a subsidiary, the African Investment Trust, mounted to £19,362 (£12,784). A dividend of 5 per cent less tax was repeated and the balance carried forward moved up to £19,524 from £15,052. Another subsidiary, Mazoe Consolidated Mines, showed a profit of £9,911 after charging amortization and taxation compared with £7,171 during the company's initial period of nine months. A dividend of 7 per cent was declared as against 5¼ per cent previously and the amount carried forward amounted to £348 (£91).

Year to June 30	*Total Revenue*	*Taxation*	*Net Profit*	*Dividends*	*To Reserve*	*Carry Forward*
	£	£	£	£	£	£
1955	282,135	69,861	60,995	55,663	3,511	50,375*
1954	286,184	97,709	65,272	39,187	24,000	46,571

* After taking into account loss of £6,142 on sale of subsidiary's holding in parent company.

At their present price of around 6s. Lonrho 5s. shares give an attractive yield of 8 per cent. Sir Joseph Ball is chairman.

Lower Costs at Lake View and Star

On the whole, output figures of Lake View and Star in respect of the year ended June 30, 1955, show few differences from those of the preceding twelve months. Against this background a fall in working costs of A.5d. per ton provides the most interesting feature of production statistics.

Year to June 30	*Ore Treated (tons)*	*Grade recv'd (dwt.)*	*Cost per ton (s. d.)**	*Development (ftge.)*	*Ore Reserves Tons (000)*	*Value (dwt.)*
1955	731,609	4.74	51/11	27,858	3,714.0	4.76
1954	743,047	4.71	52/4	25,922	3,756.3	4.80

* Australian Currency.
N.B. A total of 908,836 tons of residues were retreated for a yield of 8,726 fine ozs. of gold. 1953-54 643,343 tons retreated for a yield of 9,612 fine ozs.

Dividends of 56¼ per cent were maintained on the issued ordinary capital of £560,000 in ordinary shares of 4s.

Year to June 30	*Total Revenue*	*Working expenses*	*Taxation*	*Net Profit*	*Dividends*	*Carry* Forward*
	£	£	£	£	£	£
1955	2,093,706	1,493,540	249,500	208,174	181,125	85,710
1954	2,143,211	1,537,107	272,500	199,022	172,250	79,100

* After depreciation of £31,439 (1954 - £27,152).

Malayan Tin's Improved Output

During its first quarter ended September 30, 1955, Malayan Tin Dredging produced 591 tons of tin concentrates as compared with 422½ tons during the previous corresponding period. This increase reflects operations by No. 6 dredge which was not recommissioned until October 15, 1954.

During the past financial year to June 30, 1955, a total of 8,243,000 cu. yds. (8,068,000 cu. yds.) were treated from which 1,584 tons of tin concentrates were recovered. This compares with 1,884 tons previously.

Net profits made during the past financial year amounted to £102,742 as against £168,444. Dividends absorbed £135,000 (£132,000) and the balance unappropriated declined to £119,120 from £154,011.

Prospecting by Southern Malayan

Six dredges operating continuously at Southern Malayan Tin Dredging's property during the year ended June 30, 1955, treated 15,741,000 cu. yd. for a recovery of 2,968.33 tons of tin concentrates—an equivalent of 0.43 lb. per cu. yd. This compares with the previous year's results which amounted to 15,329,000 cu. yd. of ground treated for a recovery of 2,917.9 tons equivalent to 0.43 lb. per cu. yd. Working costs during the past financial year at 8.12d. per cu. yd. showed a fractional increase over 8.1d. per cu. yd. previously.

In addition to the above output Amang dumps produced a further 69.36 tons of tin ore as compared with 64.03 tons during the preceding period.

Total revenue earned by Southern Malayan during the past financial year rose to £1,361,457 from £1,231,547. Mining costs moved up to £537,711 from £505,888 while taxation took £454,551 (£377,448) leaving a net profit of £318,165 as against £368,439. Dividends absorbed £266,228 as compared with £190,300 and after a transfer of £50,000 (£276,137) to general reserve the unappropriated balance was £77,637 (£76,525).

During the first quarter of the company's current financial year 754¼ tons of tin concentrates have been produced as compared with 728½ during the previous corresponding period.

Sungei Besi's Higher Output

A higher output of tin oxide by The Sungei Besi Mines during the financial year ended March 31, 1955, was mainly due to greater productivity in the Sungei Besi Section. Total ground mined in this section was 543,573 cu. yd. as compared with 506,246 cu. yd. previously, from which 627.86 tons of tin oxide were recovered as against 584.5 tons during the preceding year.

In the Pelepah section, the volume of ground treated declined to 1,740,000 cu. yd. from 1,901,261 cu. yd. from which 582.16 tons of tin oxide were produced as against 591.85 tons. In this latter section trouble was again experienced with pinnacles of rock and large bou'ders at shallow depths.

The higher output, together with better tin prices, brought total revenue up to £537,002 from £476,643. Mining costs at £324,937 compared with £934,932 and after taxation of £99,940 (£55,428) net profit available for appropriation moved up to £82,607 from £78,149. Dividends absorbed £36,385 (£35,976) and after amounts written off and transfers to reserve the balance unappropriated declined to £80,833 from £84,861.

Production figures in respect of the first six months of the company's current financial year show that 560 tons of tin concentrates have been produced as compared with 579 tons during the previous corresponding period.

At their present price of around 8s. 6d. Sungei Besi 4s. shares yield just under 18 per cent. Mr. G. W. Simms is chairman.

Ayer Hitam's Higher Output

Tin ore recovered by Ayer Hitam Tin Dredging during the year ended June 30, 1955, advanced to 1,413.2 tons from 1,249.91 tons during the preceding period. This resulted from treating 2,175,650 cu. yds. of ground as compared with 1,795,600 cu. yds.

Total revenue earned accordingly increased to £651,383 from £529,014. Mining costs at £145,316 compared with £160,762 and taxation amounted to £220,363 (£180,623) leaving the balance available for appropriation improved at £244,147 against £166,491. Dividends absorbed £101,250 (£99,000) and after a transfer of £100,000 (£100,000) to reserve and an amount of £29,426 written off the value of Harrietville (Tronoh) shares, unappropriated profits moved up to £112,653 from £99,898.

It will be recalled that Ayer Hitam recently purchased an electrically-driven deep-digging bucket dredge from Harrietville (Tronoh) the Australian gold producers. At the meeting of the company which will be held in London on December 16, therefore, it will be most interesting to hear what Mr. G. W. Simms, the chairman, has to say regarding the progress made in preparing for the transfer of this dredge to Malaya. It was originally estimated, that the work involved would take about three years.

Burma Corporation's Higher Profits

Profits earned by Burma Corporation (1951)—jointly owned by Burma Mines and the Burma Government—rose during the year ended June 30, 1955, to £314,798 from £270,997. This figure was struck after deduction of estimated taxation and depreciation.

Output of the company's main marketable products included 11,515 refined tons of lead; 1,036,813 oz. of silver and 13,021 tons of zinc concentrates. Full details of production during the past financial year, together with those of the quarter ended June 30, 1955, will be found on page 661 of this issue.

RECENT FINAL DIVIDENDS AND PRELIMINARY FIGURES

Name of Company	*Year ended*	*Final Dividend*	*Net Profit After Tax This Year*	*Net Profit After Tax Last Year*	*Total Dividends This Year*	*Total Dividends Last Year*
		%	£(000)	£(000)	%	%
Ipoh Tin	31. 3.55	25	N/A	N/A	37½	15⅝
Mt. Lyell	30. 9.55	11¼	N/A	N/A	16½	8¼
Barclays D.C.O.	30. 9.55	4	1,152.0	939.9	8*a*	8
Naraguta K.	31.12.54	Nil	2.8	Dr. 8.1	Nil	7½
Naraguta Tin	31.12.54	Nil	44.6	26.0	Nil	10
Sungei Way	30. 6.55	20	N/A	N/A	45	15
Rand Sel. C	30. 9.55	45	1,076.0	923.8	45	45
S.A. Tn'ships	30. 9.55	2½	117.0	327.0	2½	2½
N. Jagers'ft'n *b*	31.12.55	2½	52.8	51.7	5	5
Griq'land W. *c*	31.12.55	35d.	N/A	N/A	35d.	34.2d.
Cons. Bult'ftn *d*	31.12.55	7.25d.	N/A	N/A	15.5d.	14.4d.

a On larger capital.
b Profit figures *before* taxation.
c Dividend expressed in shillings and pence per £10 shares.
d Dividends expressed in shillings and pence per £1 shares.

SONS OF GWALIA

The fifty-eighth annual general meeting of Sons of Gwalia, Ltd., was held on November 29 at Winchester House, London, E.C.

Captain A. H. Moreing, Assoc.-M.Inst.C.E., Chairman, presided, and in the course of his speech said: When I addressed you last year I told you that for various reasons it was obvious that the domicile of the company should be transferred to Australia and you were advised in September of this year that the company received Treasury permission to effect this transfer.

The Sons of Gwalia first came into being in January, 1898, and, apart from the year 1922 following the disastrous fire which destroyed the greater part of the surface plant, the mine has been in production continuously up to the present time, a period of 57 years. During that time 6,600,000 tons of ore have been sent to the surface and treated and about 750,000 tons of sand and slimes have been re-treated for a recovery of 2,355,000 fine ounces of gold. The total of net dividends amounts to £1,761,538 sterling which is about eleven times the present capital of the company or an average of a 20 per cent. dividend on that capital over the whole 57 years.

The working result for the year ended December 31, 1954, after providing £5,000 for depreciation, amounted to a loss of £29,212.

With regard to the loan of £A.100,000 (£Stg.80,000) granted by the Western Australian Government, this is secured by a bill of sale over the company's plant and by a mortgage on the mining leases.

Owing to the delays and difficulties the financial position of the company was becoming rather difficult as there is an inevitable delay in the receipt of the Gold Subsidies. This problem has been solved by the generosity of the Western Australian Government in guaranteeing a loan by the company's bankers up to the amount of £A.50,000. Up to the present the operations for the present year show a considerable loss but this will be made good in a large measure by the Gold Subsidy when received.

The report was adopted and at a subsequent extra-ordinary general meeting a resolution was passed approving the transfer to Western Australia and the necessary regulations.

The British Metal Corporation (South Africa) (Proprietary) Ltd. is opening a branch office in the Northern Transvaal on December 1, at the following address: 212/214 Van Riebeeck Building, Market Street, Pietersburg.

The British Rubber Development Board will be renamed **The Natural Rubber Development Board** on January 1, 1956. The alteration in title signifies no change in the Board's promotional activities, but will serve to emphasize that these are confined to the interests of natural rubber.

BURMA MINES LIMITED

The following summarises the Operating results of **BURMA CORPORATION (1951) LIMITED** (Incorporated in the Union of Burma and jointly owned by Burma Mines Limited and the Union Government) for the THREE months ended 30th June, 1955, together with progressive details of Ore Extraction, Production and Estimated Revenue and Expenditure for the TWELVE months ended 30th June, 1955.

ORE EXTRACTION

Quarter ended 30th September, 1954	25,541 tons
Quarter ended 31st December, 1954	26,240 ,,
Quarter ended 31st March, 1955	24,793 ,,
Quarter ended 30th June, 1955	25,678 ,,
	102,252 tons

PRODUCTION

Quarter Ended	*Concentrating Ore Milled (dry tons)*	ASSAYS *Oz. Silver*	*% Lead*	*% Zinc*
30 September, 1954	24,495	14.461	18.125	11.995
31 December, 1954	25,320	13.623	16.968	10.943
31 March, 1955	24,920	13.067	16.501	10.669
30 June, 1955	25,034	14.583	17.405	12.732

Marketable Products were as follows:—

Quarter Ended	*Refined Lead Tons*	*Refined Antimonial Lead Tons*	*Refined and Doré Silver Fine Oz.*	*Copper Matte Tons*	*Nickel Speiss Tons*	*Zinc Concentrates 57%-58% Zn. Dry Tons*
30 September, 1954	2,615	126	227,175	71	148	3,347
31 December, 1954	3,221	194	279,552	77	185	2,994
31 March, 1955	3,529	—	310,654	50	35	2,954
30 June, 1955	2,150	56	219,432	99	159	3,726
	11,515	376	1,036,813	297	527	13,021

ESTIMATED REVENUE AND EXPENDITURE

	For Quarter ended June 30, 1955		*For the twelve months ended June 30, 1955*	
Estimated Gross Revenue (after adjustment of value of Metal Stocks)	K.85,00,000	£637,500	K.3,19,04,700	£2,392,852
Estimated Operating Expenditure	K.60,50,000	£453,750	K.2,18,11,700	£1,635,877
Estimated Operating Profit	K.24,50,000	£183,750	K.1,00,93,000	£ 756,975
Estimated Taxation	K.12,25,000	£ 91,875	K. 52,25,000	£ 391,875
Estimated Depreciation on Machinery and Plant, etc.	K. 2,00,500	£ 15,037	K. 6,70,700	£ 50,302
Capital Expenditure	K. 4,38,200.	£ 32,865	K. 13,06,400	£ 97,980

After deducting the foregoing estimates for Taxation and Depreciation the estimated Net Profit for the year is K.41,97,300 (£314,798) which compares with a Net Profit of K.36,13,300 (£270,997) for the previous twelve months.

Sales of pre-war stocks of Zinc Concentrates have again made a substantial contribution to the financial results.

The Sterling figures shown are based on a Rate of Exchange of 1s. 6d. per Kyat.

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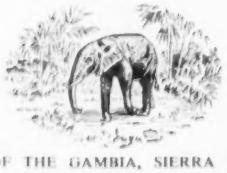

AUTHORIZED CAPITAL	£4,000,000
ISSUED AND FULLY PAID CAPITAL	£2,500,000
RESERVE FUND	£1,900,000

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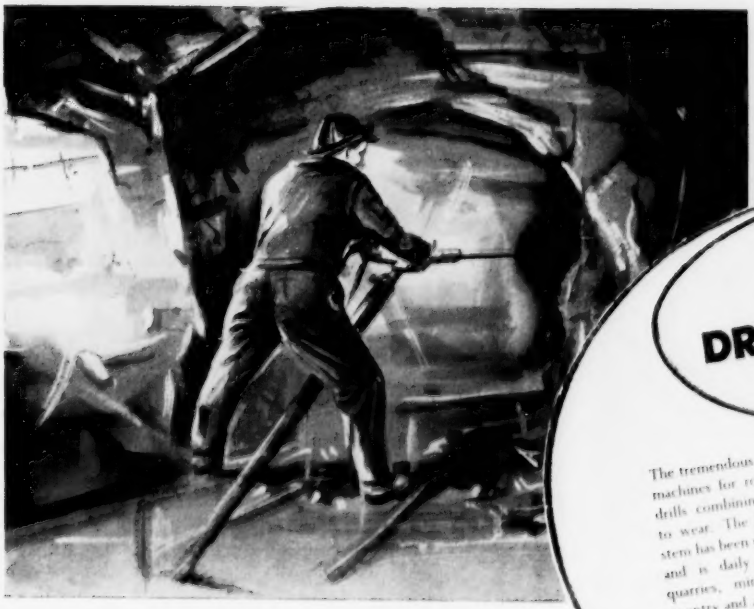

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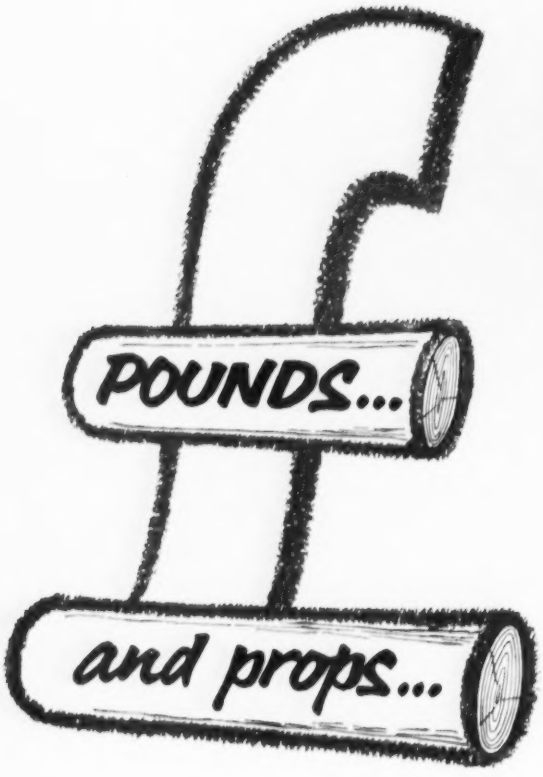

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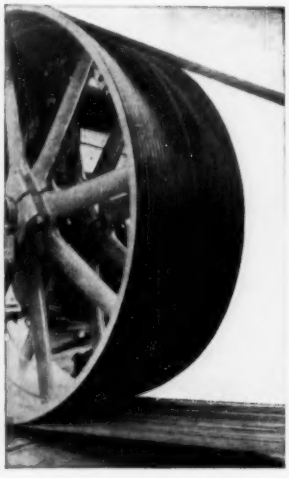

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